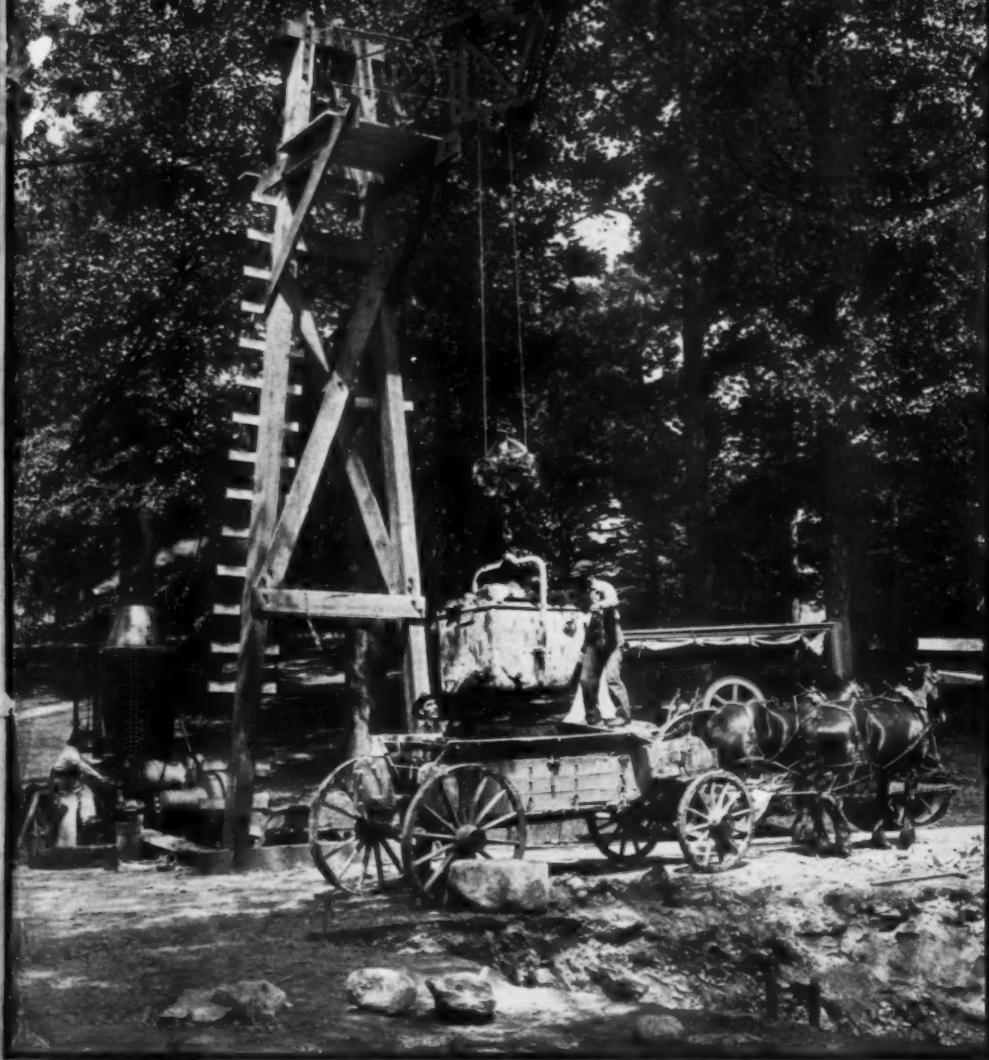


62

# Contractors *and* Engineers' Monthly



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VOL. VII, No. 1

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JULY, 1923

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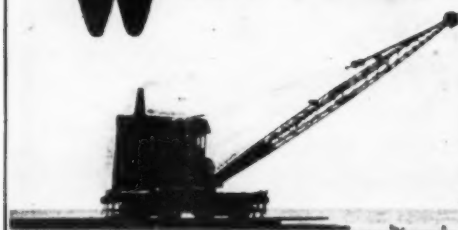
Issued Monthly, by The Civic Press, 443 Fourth Ave., New York

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Price 25 Cents, \$1 Yearly



# Where to Purchase



A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment. A star (\*) before the manufacturer's name indicates that his advertisement appears in this issue.

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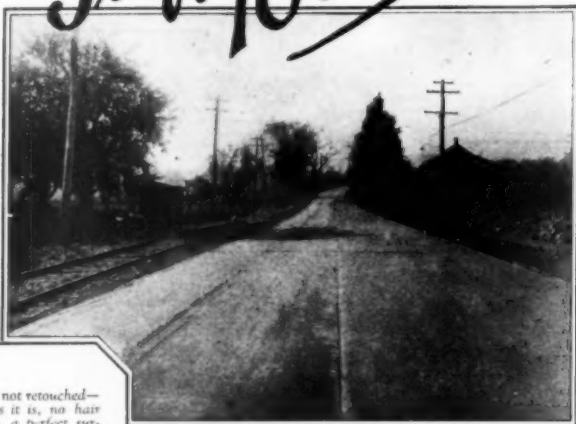
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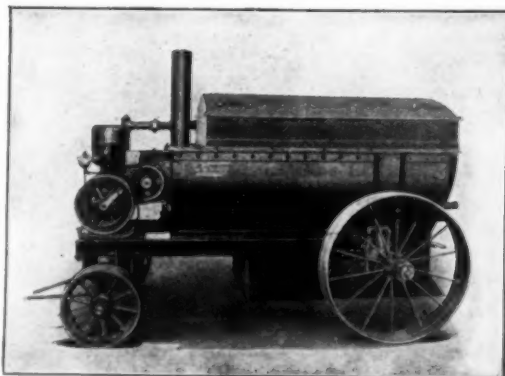


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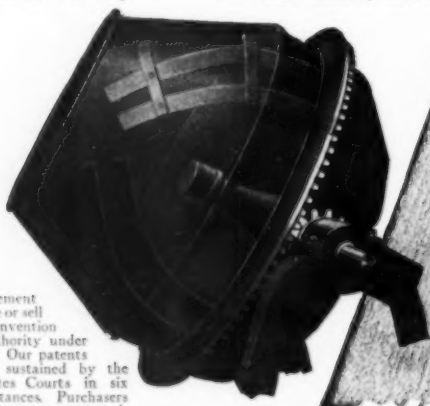
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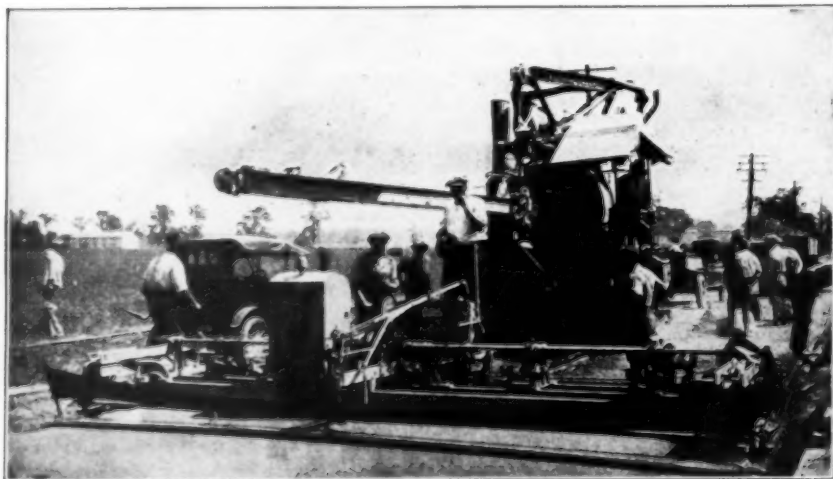
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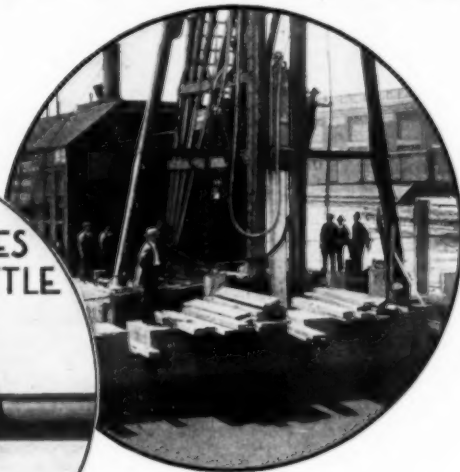
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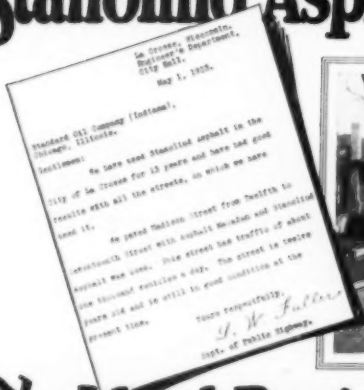
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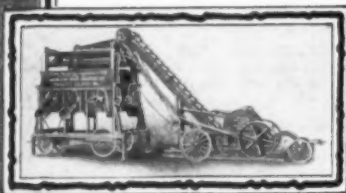
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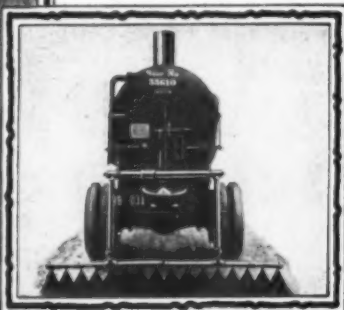


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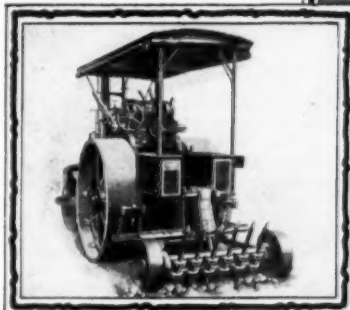


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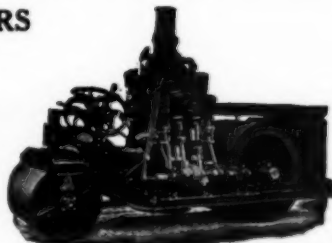
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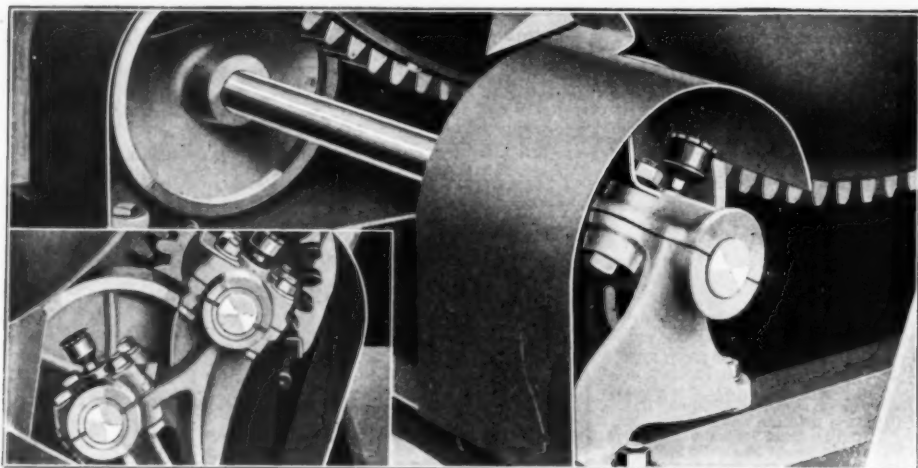
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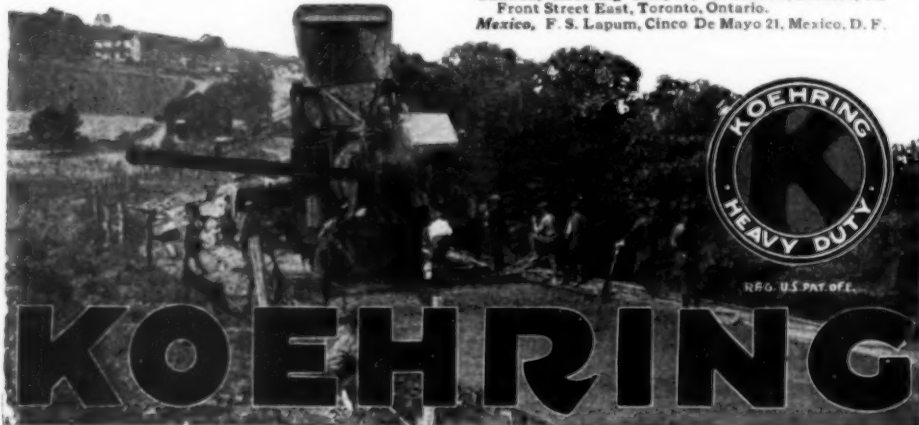
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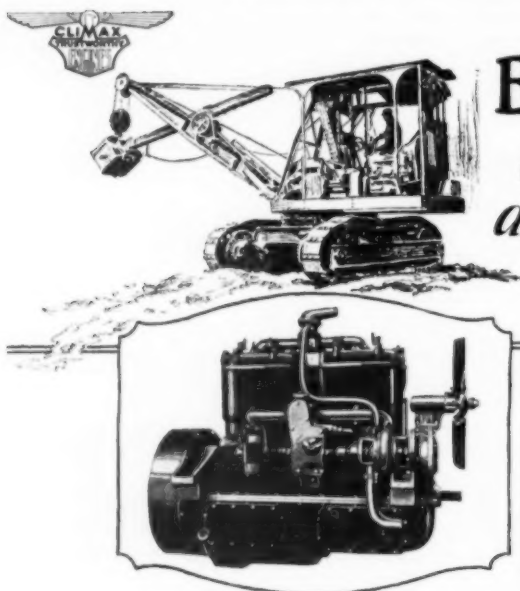
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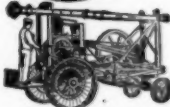
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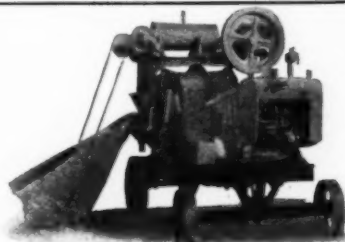
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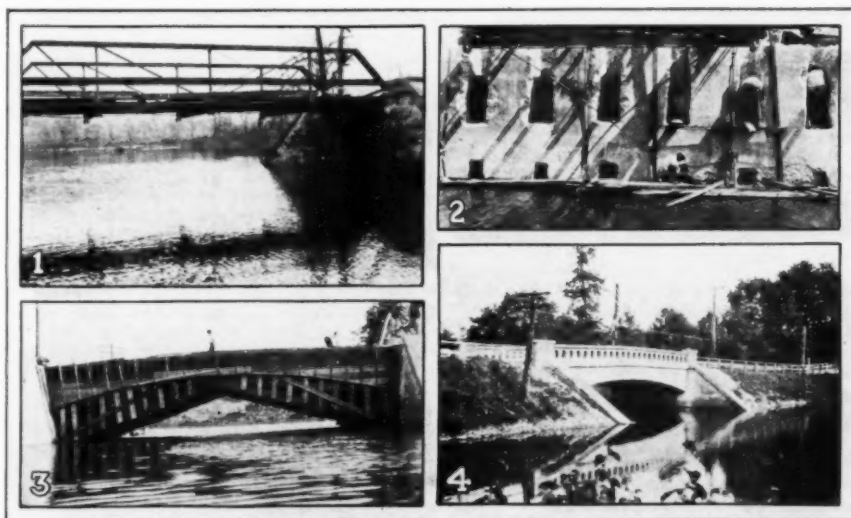
## A Clever Solution of a Bridge Problem

By A. C. Irwin

**E**NGINEERS as well as diplomats are sometimes confronted with a situation in which they either have to remove an obstacle or make it part of a new pattern. The old concrete abutments of the Cross River bridge at Katonah, N. Y., were "hard facts" that had to be dealt with when it became necessary to construct a new bridge at this point. These abutments had to be either made a part of the new structure or removed. The way in which County Engineer Charles MacDonald dealt with them makes an interesting story.

The old bridge consisted of steel trusses supporting a floor system of I-beams and wood planking. About 23 years ago the state of New York constructed a dam in the Croos River which raised the elevation of the water at the bridge, making it necessary to raise the bridge. At that time new concrete abutments were built and the old structure placed back on them.

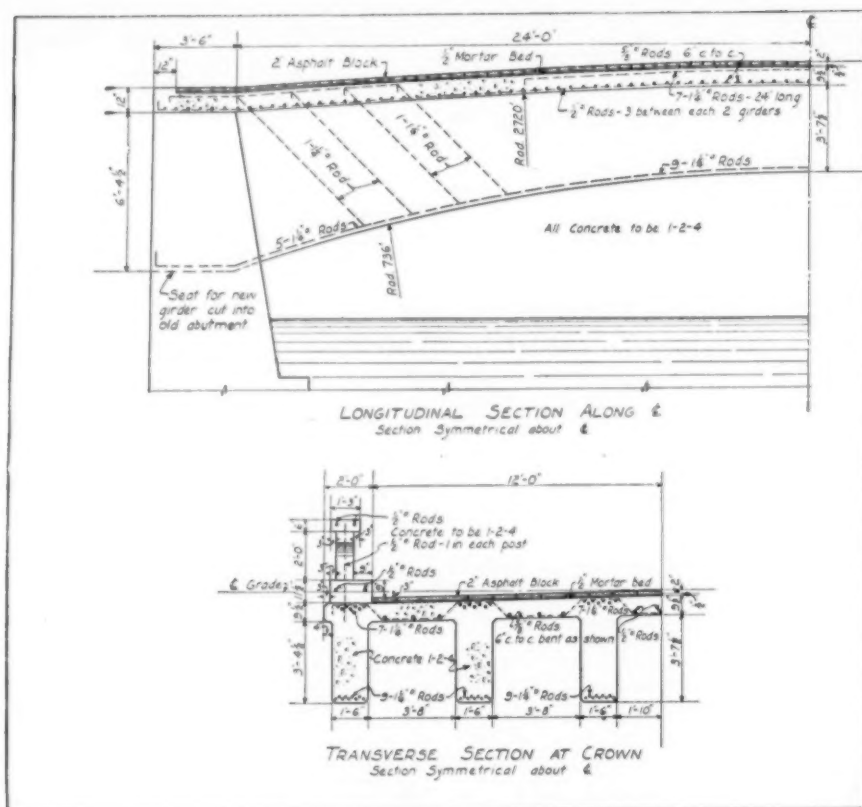
About two years ago a truck broke through the floor of the old bridge, bringing about an examination of the floor system and the dis-



CONCRETE BRIDGE REPLACES OLD WROUGHT-IRON BRIDGE IN KATONAH, N. Y.

1. Old wrought-iron bridge which was replaced by a concrete bridge using same abutments. 2. Concrete of old abutment cut to receive ends of A-trusses and new concrete girders. 3. A-trusses and forms enclosing parapet. 4. The new concrete girder bridge built on old abutments of iron bridge





TYPICAL SECTIONS OF KATONAH BRIDGE

covery that it was too light to carry present-day loads. Since the old bridge was too narrow and the cost of making the floor system sufficiently strong would be about one-third the cost of a new structure, it was decided to replace the old bridge with one of reinforced concrete. The bridge is in plain view from the highway on both sides, and the location seemed to demand that type of structure most approved for architectural appearance, namely, the arch.

The engineers were then faced with the problem of what to do with the old concrete abutments, then over 20 years old. These abutments were constructed to support simple truss spans, and therefore were not adapted to take the thrusts of a reinforced concrete arch. After it was concluded that the site demanded an arch type of structure, or at least one having the appearance of an arch, it was evident that the old abutments would either have to be increased in size or replaced with new abutments, and probably new foundations constructed to prevent any settling

of the abutments from the vertical and horizontal forces imposed by the arch.

Ingenuity, however, found a way to obtain the desired result without resort to expensive strengthening of the old abutments or construction of new ones. This was accomplished by designing the bridge as a reinforced concrete girder and curving the underside to conform to the intrados of an arch. Since the apparent springing line of the arch would naturally be lower than the seat of the old bridge, it was necessary to cut seats for the curved girders into the faces of the old abutments. The seats for the six girders are shown in the illustration. The concrete of these abutments was placed over 20 years previous and before "water transportation" of concrete came into vogue. When the work of cutting the seats was under way, this concrete was found to be very hard indeed—so hard that in many cases pieces of the coarse aggregate were broken by the air drills before the concrete would break. Thus, the cutting proved somewhat more expensive than had been anticipated,



but showed conclusively that the old abutments were entirely worthy to become a part of a permanent bridge.

The water under the bridge was 7 to 8 feet deep and it would have been necessary to drive piles to support the forms for the girders if some other means of support had not been found. The expense of getting pile-driving

equipment on the work and driving piles would have added a very material percentage of the total cost of the bridge, but the ingenuity of the engineers again discovered a plan to save this proportionately large expense. Six wooden A-trusses were designed and built to carry the form work. The ends of these trusses rested in niches cut in the concrete abutments.

## The Cost-Plus Method as a Remedy for Builders' Difficulties

A Study of the Ailments of the Building Industry

By Morgan G. Farrell

Vice-President, Frank Hill Smith, Inc., Engineers, New York and Dayton

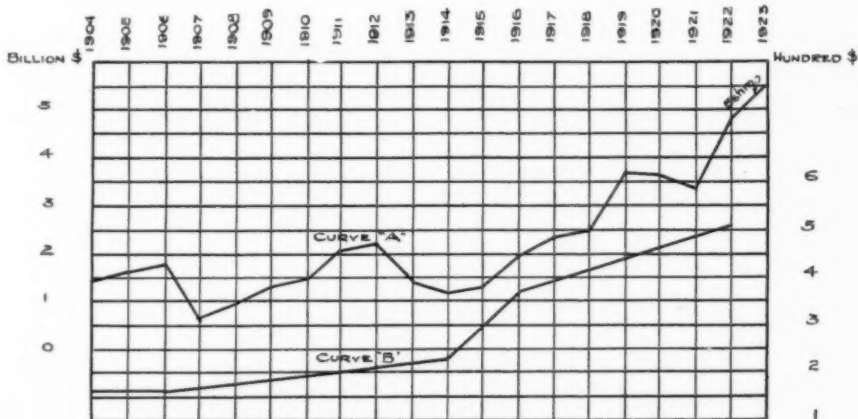
THERE is not much in the latest developments in construction markets to inspire the thoughtful builder—the man who has made building his life job—with much satisfaction at the state of the industry. In fact, when he looks back, reflectively, over the last twenty years with its violent fluctuations between complete stagnation and insane activity, he may well wonder whether his work is a calling or a sickness—whether it is worth the thought, the planning and the hard experience.

He recalls the outburst of housing operations in the larger cities after the arrival of electric rapid transit, before the panic of 1907, and the two or three years of idleness and deflation following that catastrophe. With some complacency he can dwell on the few normal years from 1910 to the outbreak of the World War. But there were only about three-and-a-half

years of it, in twenty. From that time to this, the industry has ridden a stormy course: first, the rush and extravagance of war work, to the exclusion of all civil construction; then the period of general deflation when, in spite of the acute shortage of living and business space, no one could be induced to build, on any terms.

But, while every other commodity suffered deflation, building remained, with minor waverings, just where the war had put it. Then suddenly, to the astonishment of all concerned, the nation made up its collective mind that there was no use waiting any longer for prices to drop. It must have houses, and if it could not have cheap ones, it must pay for expensive ones. And in a few months everybody and his neighbor were building.

The adjoining chart shows graphically the



BUILDING VOLUME AND PAY-ROLL DATA FROM 1904 TO 1923

Curve "A" shows the building volume in billions of dollars. Curve "B" shows the comparative pay-roll in hundred-dollar units



history of those twenty years. Curve "A" represents the relative volume of building, in dollars, of buildings of all sizes and types; "B" shows the fluctuation, mostly upward, of the average wage of carpenters, painters, bricklayers, plasterers, and common laborers, in the numbers usually employed on non-fire-proof, masonry-walled buildings.

It illustrates forcibly the first and second of the ills building is heir to—periodicity and ever-increasing labor cost. It also indicates that there is nothing unprecedented about to-day's conditions except in the matter of scale in price and volume, as the man who has made construction his profession for a long period of years (and there are some left) well knows. He has seen labor scarce and arrogant before—"snowballing" is no stranger to him; he has witnessed the same furious activity among the speculative builders, and the influx of willing but ignorant recruits into the contractors' ranks.

And this brings us to the third building ailment. The speculators affect material prices principally by creating an excessive demand; they do not greatly affect the labor market, because they are too wise to pay any more than they must. But the adventurer into contract building is a bull in a china shop. Entering into competition with established or more experienced firms, who know their costs, with a profound lack of knowledge of most of the fundamentals of the business, his estimating is generally unsophisticated enough to insure his getting a few jobs to start with. He bids recklessly for labor, purchases in high markets, keeps no proper costs. As he knows nothing about the short cuts, the time- and labor-saving tricks which have become A B C to the experienced, the result is inevitable. After a year he is insolvent, but does not know it. Soon his financial difficulties multiply too rapidly to be misunderstood. One job will not carry the other any more. Although money is coming in from new work, it will no longer meet the bills that have accumulated on old, finished and paid-for jobs. So he quits, having learned his bitter lesson. But multiply him by a few thousand, and they have done enough damage to be serious, even in so large an industry with so many careful and responsible firms to give it stability.

The third ailment of the business, then, is uncontrolled and irresponsible competition.

The fourth is unhappily prevalent enough, although leading architects and engineers have striven through their Institute and their several societies, as well as through license legislation, to correct or at least check the condition, namely, the large annual loss to contractors due to incorrect, incomplete or badly drawn plans and specifications. The builders have no appeal. As one of them put it: "The owner is always right; the architect is never wrong; the builder is never right." There is a large element of truth in that. Just one instance: A high school was to be built in a certain eastern city, not so very far from the Hudson. The commission was awarded by the School Board to a political architect. When

the plans were sent out for bids, there was such a storm of criticism of them, that the city fathers took alarm and engaged a second architect to go over and revise them. To save time, the drawings were not changed, but all revisions were incorporated in a printed bulletin called "Addenda to the Specifications," copies of which were supposedly sent to all bidders. The work included in the Addenda amounted to about 20 per cent of the whole cost. The work was awarded to a local contractor who was by far the lowest bidder.

Hardly had the job been started when the trouble began. The contractor denied that he had ever received the Addenda, and insisted that his bid covered the original plans only; the architects by this time were in a state of open war, while the Board, lacking the moral courage to act, let matters drift along. Each architect handed the contractor his own idea of a detail, and the contractor used whichever he saw fit. Claims for extras galore were filed.

The work was finally completed under the direction of an engineer who was appointed dictator for the job. According to last accounts, the litigation is still going strong. The school has been in service four years, and the contractor is still waiting for 30 per cent of the money due him.

This is typical of the damage a builder is obliged to tolerate through unfair, unbusiness-like and incompetent management on the part of owner and architect. Readers will have no trouble recalling similar experiences.

Still another difficulty under which builders labor is inherent in the competitive bid system of awarding contracts: that is, the vast amount of lost motion, wasted effort and money spent in preparing estimates, of which a very small percentage materialize as jobs. It is said by the treasurer of a large New York building firm that of the total annual account for advertising, sales effort, estimating, preliminary drawings, surety bonds accompanying bids, etc., only 5 per cent is directly chargeable to work actually contracted for. The other 95 per cent brings no return and is chargeable to general overhead. If the builder was gifted with second-sight, so as to be able to distinguish those who were having his estimator spend a week or two preparing a bid, without the remotest intention of awarding him the contract or even of proceeding with the work as planned, this high percentage of non-return effort could be effectually reduced. A disproportionate amount of energy must be expended to secure work from even the best-intentioned sources. There are the preliminary sketches and estimates, the bids based upon complete plans, and usually the refiguring. After it has all been done, someone else gets the job.

Perhaps the worst effect of the competitive bid method is that prospective clients have become so thoroughly educated to it that they know of no other admissible way of awarding their building work. Reputation for honesty, excellence, speed, workmanship, responsibility, helpfulness, mean little except to the judicious



few. It is as though one were to be seduced away from a known and tried tailor by the siren song of the black-type advertising: "Imported English cheviot suit made to order, with extra trousers: \$26.85." Anybody with any sense knows they are not imported, are neither English nor cheviot, and that it would be impossible to make a decent suit for \$26.85, not to mention the extra trousers.

Recapitulating, the five principal ailments of the building industry are:

1. Periodicity
2. Rising labor cost
3. Irregular competition
4. Indefinite specification
5. Expensive sales effort

The determination of the underlying causes and permanent remedies for these opens a broad field of service to the engineers and economists who have at length recognized the importance of the industry to national life, and its need of intelligent, technical control.

#### Cost-Plus Method Is Rational

The immediate concern of this paper, however, is to put forward the cost-plus method of building as the most rational and economically sound means of offsetting the ills outlined above, as well as of laying a foundation for a more scientific organization of the industry.

No manufacturer would think of selling his goods at a fixed price under such conditions as those recapitulated, unless such price could be high enough to preclude any chance of loss. Yet building is a form of manufacturing incomparably more complex than the production of any other commodity, in that each building produced is unique. There is, ordinarily, no such thing as quantity production. Each construction job must be planned and carried out as a special order. Then, the working force is constantly changing; workmen have no great incentive to exert their best efforts, since each job may be the last with that employer.

Material markets offer little choice to any but the largest construction companies. Then, too, the swift progress of the work is dependent upon other persons—the steel contractor, steam-fitter, plumber and so on—who must get their material on the job and set it without delay. There are a host of regulations to observe—those of the fire and accident insurance

companies, of state labor boards, municipal departments, fire, health, building, not to mention the trades unions and the inspections required by the architect and owner. Picture an automobile manufacturer, for example, getting rich if he had to comply with all these and sell his cars at a price fixed by haphazard competition.

The realization of the impossibility of continuing the competitive bid system with justice either to themselves or to their clients has already led a great many of the leading engineer-contractors to announce a future policy of building on the basis of actual cost plus a certain percentage. The conspicuous success they have had, not only in demonstrating that this is the cheapest way to build, but also in selling the idea to new and untried clients, should provide enough encouragement to those

who have not yet taken their stand.

Several methods have proved workable:

First: A strict basis of cost plus a fixed percentage of the cost. The builder may give an approximate estimate, but does not guarantee it. Cost here means labor, material, subcontracts and job expense, such as insurance, superintendence, telephone, clerk of the works, tool and plant hire and engineering. The commission is usually 10 per cent.

Second: Cost plus fixed fee, the owner financing the work. Here the builder provides the organization and skill and carries through the work as usual, but assumes no financial responsibility.

He requisitions upon the owner for payroll, material bills and other payments, usually weekly. His fee is merely a service charge, hence it is usually a fixed sum agreed upon between his client and himself.

Third: Cost plus percentage accompanied by a guarantee not to exceed an agreed amount. A variation of this method gives the builder a fraction (usually one-fourth and upward) of the amount his final cost falls below the guarantee. There are other modifications of these, such as the inclusion of plans, usually of standardized types of construction, which naturally lowers costs, sliding scales of remuneration to the builder, bonuses, etc., but the three methods outlined cover the ground without further particularizing.

#### How the Cost-Plus Method Works

Let us see how the cost-plus method works out in practise.

#### The Cost-Plus Method as a Remedy for Builders' Difficulties

To the experienced constructor, the advantages of the cost-plus method to the purchaser are so obvious that it is difficult to see why it is not equally apparent to anyone of ordinary business judgment. Since, however, its successful application depends entirely on the contractor, it is important to choose well. The contractor must be both honest and able, must have a record of successful operation and satisfied clients. He must be an organizer and a pusher, must know how to purchase and keep costs down. In brief, he should be one who is seriously concerned with making his business a permanent institution. If the building public is to be convinced of the inherent economy of the cost-plus method, it will be through the efforts of those builders only whose constant aim is competence, efficiency and economy.



Under the competitive-bid plan an owner who proposes to build would employ an architect to draw his plans and collect bids, awarding the work to the lowest bidder. Immediately there arises a situation which is too much of a strain on human nature. The three parties to the contract pull in different directions, all opposed to the best interest of the work. The architect has given his client an estimate of cost which he must try to substantiate; the builder wants the job, so his figure must appear low; and the owner, thinking of the amount he has set aside, is only too willing to accept the lowest bid. Eventually the last-named finds that the builder's contract by no means covers a finished structure and that there are innumerable extras, purchases and supplementary contracts. Favorite last words of owners building for the first time, are: "If I had only known ——" Or, again, the builder finds he has underestimated. He can do one of two things—take it out of the job, or honestly go ahead and in some cases fail and abandon the work. In either case, the owner is the loser. And in either case the architect loses a client.

By a perfectly conducted cost-plus plan, on the other hand, the owner pays for no more and no less than he gets, plus a known and moderate profit. When a contractor has no losses to make up for, he can get along on a lower regular profit. The owner benefits by any favorable change in the labor or material market. He pays no contingency allowances unless the contingency arises. If one million bricks are used, he pays for just that many and not for an estimated million-and-a-quarter. In other words, the owner gets all the "breaks" and the builder delivers a perfect job because he has pride of craft and is free from the apprehensions of possible loss which haunt the lump-sum contract.

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One firm of engineer-builders has built up a nation-wide clientele and has never executed a commission except on the cost-plus plan. They have had as many as eight commissions from one concern. In fully nine out of ten cases they can show a saving of a substantial percentage of the guaranteed estimate. They have clients who order them to go ahead with construction work without an estimate, merely telling what is wanted. A business of that kind can be founded only upon absolute honesty and applied business methods.

More is being done to-day to stabilize the building industry than ever before. The great architects and business men, aided by the Government, are striving to control the volume and period of big building so as to hold it out of a market flooded with essential building and release it for completion when that demand falls off. Other important reforms must be carried out before the industry takes its own place on a parity with manufacturing, to which it has so strong an analogy. Among them, easily first in importance is the adoption of business methods among builders. There is a place for organization and system, for accounting and cost methods, for planning and scientific management, just as in manufacturing.

When this is more generally realized, and more practically applied, builders will find the public not unresponsive to so ready and effective a remedy for many present building ills as the cost-plus plan.

## Present Prosperous Conditions in the Building Trades

**A**T the present time the prosperity that our business men were looking for is actually in full swing, but this prosperity did not develop just as had been expected. First, it is, of course, true that we have experienced a great increase in surplus bank reserves and that ample credit is available for the financing of our business activities. Second, it is also true that a domestic trade boom has developed, but the basis of this boom has not been entirely sound, because the liquidation of manufacturing costs was cut short during 1922, while the prices obtained by grain growers did not materially improve, the consequence being that the purchasing power of the large agricultural classes has been decreasing

instead of increasing and our domestic trade activity has consequently been temporarily supported almost entirely by the filling of the urgent needs resulting from the curtailment during the war. Third, our present prosperity does not enjoy that degree of permanency that would come from an increasing foreign trade, for Europe has not been able to sell securities in America in large volume, and the people across the water have therefore not yet been able to buy of us machinery, supplies, and raw materials that they need in order to make up for the shortages of recent years.—George Woodruff, Vice-President, The National Bank of the Republic, Chicago, Ill.



## LEGAL POINTS FOR CONTRACTORS

These brief abstracts of legal decisions in the contracting fields may aid you in avoiding similar difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

**Edited by A. L. H. Street, Attorney-at-Law**

### Approach as Part of "Bridge" Contracted for

Where a contract to construct a bridge over a railway right of way was silent as to construction of approaches, the contractor was bound to build them, but was entitled to reasonable compensation for this work, holds the St. Louis Court of Appeals, in the case of Hannan, Hickey Brothers Construction Co. vs. Chicago, Burlington & Quincy Railroad Co., 247 Southwestern Reporter, 436.

### Contractor's Ignored Suggestion Did Not Avoid His Guaranty

In the case of Robinson vs. United States, 43 Supreme Court Reporter, 420, plaintiff filed a claim on account of constructing the interior finish in a Federal building in New York City. The Government was allowed a deduction on account of the cost of repairing the work. The allowance was based on a clause of the contract whereby the contractor guaranteed the condition of the work for one year after acceptance.

The specifications called for window-sashes of solid oak. After the contract was made, the contractor called the architect's attention to the fact that solid oak was not well suited to the damp climate, and suggested modification of the specifications. The suggestion was not acted on, and warping occurred. The contractor refused to repair the condition. The Court of Claims found that the warping was due partly to unsuitability of oak, and partly to the facts that the oak used was not of the best quality, and was not worked up in a first-class manner. Holding that, under these findings, the contractor was not exonerated from liability under the guaranty, the United States Supreme Court, in affirming a decision in the Government's favor, said:

"The contractor contends that the Government's refusal to adopt the modification proposed relieved him from the obligation under the guaranty. The contention is unsound. He entered into a contract plain and comprehensive in terms. There was no finding of mutual mistake, or of fraud, misrepresentation, or concealment on the part of the Government or any of its officers or employees. Under such circumstances the contractor cannot be relieved from an obligation deliberately assumed. . . . If the warping had been caused entirely by the adoption of wood unsuitable to the climate, it may be that, as a matter of construction, the guaranty would not extend thereto. But the findings do not present such a case."

### Contractor's Choice of Remedies Where Owner Breaks Contract

Indicating the legal rights of a contractor who is aggrieved by an owner's fault in preventing performance of a contract, the Missouri Supreme Court lately said in the case of Kansas City Structural Steel Co. vs. Athletic Building Association, 249 Southwestern Reporter, 922:

"If the defaults of the owner or of one who stands in his place prevent the completion of a building contract, the contractor may sue upon the contract and claim damage for its breach, or he may sue in quantum meruit for the reasonable value of the work and materials furnished. He cannot, however, recover on both theories; by suing in quantum meruit [for reasonable value] he waives his right to an action for damages. . . . If he elects to sue upon the contract, the measure of his recoverable damages will include what he has actually expended toward performance and the profits he would have realized by performing the whole contract. . . . If, however, he chooses to sue in quantum meruit, his recovery will be limited to the reasonable value of the labor and material furnished."

### Workmen's Compensation Insurance Fees Not Part of Expense Under Cost-Plus System

A contract entitling a contractor to the cost of labor and materials used in remodeling a house, plus 10 per cent, did not entitle him to include the amount of premium paid by him to secure workmen's compensation insurance covering the workmen, according to the decision of the Appellate Division of the New York Supreme Court in the case of Russell vs. Pitchler, 198 New York Supplement, 702.

### Contractor's "Overhead" Not to Be Considered Under Cost-Plus Contract

Plaintiff contracted to remodel buildings for defendant "on a time and material basis, with 10 per cent profit as compensation to the contractor, the records of the cost to be kept at all times in such a manner as to be checked and audited by the owners." Interpreting this contract in the case of Lytle, Campbell & Co. vs. Somers, Fittler & Todd Co., 120 Atlantic Reporter, 409, the Pennsylvania Supreme Court decided that it covered necessary cost of operation, the cost of labor and materials, the wages and salaries of men engaged in the particular work, but not "overhead," which, pre-



sumably, is to be covered by the 10 per cent commission. In the course of its opinion, the Court said:

"Overhead, or general expenses . . . includes all administrative or executive costs incident to the management, supervision, or conduct of the capital outlay or its business. They are to be distinguished from operating charges, or those items inseparably connected with the productive end. The latter charges contain all elements of labor and materials, which directly produce a definite end, measured by cost or value. Overhead charges are generally of a non-productive nature, in that they do not of themselves directly create a definite utility, and, while they are essential to the life of a business concern, yet in determining the value and the selling price of the utility, they must not be confused with those charges which actually produce a definite end, and upon which an organization depends for its continued existence. . . .

"On the other hand, operating charges are those which may be seen as the work progresses, and are the subject of knowledge from observation. The really essential line of distinction, as we view it, is that the one is a producing cost, capable of being ascertained by those dealing with the company, and the other is a non-productive, or indirect, charge, difficult of ascertainment, and not ordinarily within the outsider's knowledge. The latter utilizes the earnings produced from the operating end, as the stockholders must, from the earnings of the productive end, pay the charges incident to the management of their capital invested, depreciation, interest, and the risk of the venture."

#### **When Time for Completing Work Is Not Specified in Contract**

A contract for construction work is complete, although it fails to state a time within which the work is to be completed, holds the St. Louis Court of Appeals in the case of *Stiel vs. Turner Real Estate Co.*, 249 Southwestern Reporter, 107. Says the Court:

"The rule undoubtedly is that where one agrees to do something, and no time is specified for doing the work, the law implies that it shall be done in a reasonable time."

#### **Authority of Office Managers in Collecting**

Plaintiff contracting company maintained a branch office, and defendant, being indebted to the company, went to that office to settle. The office manager asked that defendant make the checks payable to him, because he wanted some money. This was done, the manager receipting for the payment. Apparently, the manager failed to turn the checks or their proceeds over to the company, and the company sued defendant for what he owed. The case turned on the point whether payment to the manager under the circumstances stated was payment to the company. Upholding verdict in defendant's favor, the Massachusetts Supreme Judicial Court said in the case of *R. T. Adams Co. vs. Israel*, 138 Northeastern Reporter, 319:

"The plaintiff held out Carnes as its manager to transact its business in Springfield; and in view of the nature of that business, and all the circumstances known to the plaintiff, it was a question for the jury whether its employment of the agent, and the placing of him in control of the office with the powers given him, the public might properly understand that he had authority to collect payments due on contracts, in the absence of knowledge of any limitation upon the extent of his authority in this respect. . . . The circumstances that the amounts paid were by checks payable to the order of the agent is not decisive, but was to be considered by the jury in connection with all the other evidence, including the nature of the business; it was for them to decide whether Carnes was authorized to receive payments, and, if so, whether they could be made by checks payable to himself. If he were found to be authorized to receive on behalf of the plaintiff the amount due, it also could be found that he might do so either in cash or by check payable directly to himself. The case at bar is distinguishable from those where goods are sold by an agent who merely solicits orders without any authority to receive payment therefor. In those circumstances the principal is not bound by payment to the agent."

#### **Interpretation of Ambiguous Contracts**

There is a general rule governing the interpretation of contracts, to the effect that where a clause of an agreement is ambiguous or indefinite, the mutual understanding of the parties may be inferred from their acts in the course of performance of the contract. This rule was applied recently by the California District Court of Appeal in the case of *Laiblin vs. San Joaquin Agricultural Corporation*, 213 Pacific Reporter, 520, in aid of a contract clause referring to a contractor's right to progress payments. The Court said:

"While a practical construction of a writing by the parties thereto is not by any means conclusive as to the correct construction of the instrument, such construction is entitled to great, if not controlling, weight in determining its proper interpretation, where the language requiring interpretation may be characterized by more or less ambiguity."

#### **Owner's Failure to Make Monthly Payments Justified Abandonment of Contract**

The principle that a contractor is justified in refusing to proceed under a contract on the owner's failure to make monthly payments required by the agreement was lately affirmed by the California District Court of Appeal in the case of *Laiblin vs. San Joaquin Agricultural Corporation*, 213 Pacific Reporter, 520. It is further held that on the contractor's electing to abandon the work on account of such default on the part of the owner, he may recover the reasonable value of the work performed, not being bound to compensation computed on the contract rate.









AN EARLY PICTURE TAKEN ON THE NEW ORLEANS NAVIGATION CANAL, SHOWING ONE CONCRETE MIXING PLANT NEARING COMPLETION AND THE OTHER IN OPERATION

Material was supplied to these mixers by belt conveyors

sources of supply with all water as well as rail transportation facilities thereon.

On March 12, the authorization of the Capital Issues Committee was given. On March 15, the George W. Goethals Company, Inc., was retained as consulting engineers on the big job. George M. Wells, Vice-President of the firm, was put in active charge of the work. Dirt began to be moved on June 6, 1918.

The river end of the site chosen for the canal consisted of low and flat meadow-land. There were a few houses helter-skeltered about, like blocks in a nursery. The middle of the site was a gray cypress swamp several miles in extent with five or six hundred trees to the acre and always awash. The lake end was trembling prairie marsh-land subject to tidal overflow and very soft. With dredges, spade, mechanical excavators, pile-drivers and dynamite, the work opened.

A great force of men began to throw up by hand the levees that were to serve as banks for the turning-basin, the lock and other portions of the canal. This levee would keep the liquid material, dredged out, from running back into the excavation. The turning-basin, 950 feet by 1,150 feet, was an expansion of the original industrial basin. It was situated several hundred feet from the lock, and its purpose was to give ships entering the canal from the river and passing through the lock space to turn in, as well as to furnish a site for the concentration of industries. The Foundation Company had in the meantime decided to establish a shipyard on this basin. Its engineers were on the ground, and its material was rolling.

One dredge was sent around Lake Pontchartrain to commence boring in from that end. This could not be done on the river end. The Mississippi is too unruly to risk such liberties. The 2,000-foot cut between the river and the lock had to be done last of all when the rest of the canal and the lock were finished and

the new levees that would protect the city against its overflow were solidly set. Only a few hundred feet from the turning-basin was Bayou Bienvenu, which runs into Lake Borgne, part of Lake Pontchartrain. Through Bayou Bienvenu, a small excavator was sent to cut a passage into the turning-basin to allow the 22-inch dredges to get in and work outwards towards the lake and the lock site.

Week by week the labor gangs increased and great excavators stalked over the land, pulling themselves along by their dippers, which bit out chunks of earth as big as a cart when they took hold. The smack of pile-drivers, the thump of dynamite, and the whistle of dredges filled the air. Buildings sprouted up like mushrooms. In the meadow, half a mile from the nearest water, the shipyard of the Foundation Company began to take form. It was the plan to finish the canal by January, 1920.

#### Canal Plans Expanded

The creation of another shipbuilding yard, which was building ships 400 or more feet long, drawing 27 feet when loaded to capacity showed that an 18-foot canal would not be adequate. By June 11, 1918, the plans had been revised to give a 25-foot channel, but when it was considered that a lock cannot be enlarged, plans were made for locks with a 30-foot depth over the sill at extreme low water and a canal 300 feet wide at the top and 150 feet wide at the bottom. The Dock Board decided on June 29, 1918, to continue construction on this basis.

#### Digging the Ditch

No rock was encountered in dredging the canal. The cost was below what the engineers estimated, less than 30 cents a cubic yard. But a novel situation did develop which would have sent the cost up materially if it had not been met promptly.



Louisiana is what geologists call a region of subsidence. The Gulf of Mexico formerly reached to where Cairo, Ill., now is. Washings from the land during the slow-moving centuries pushed the shoreline outward. The humus of decaying vegetation raised the ground surface still higher. This section of Louisiana, built by the silt of the Mississippi, is of course the most recent formation. As the subsoil packed more solidly, the wilderness sank beneath the waters. The Mississippi built up its sand-bars again, storms shaped them above the waves, marsh grass raised the surface with its humus, and another forest grew. This in turn sank, and so the process was repeated time after time.

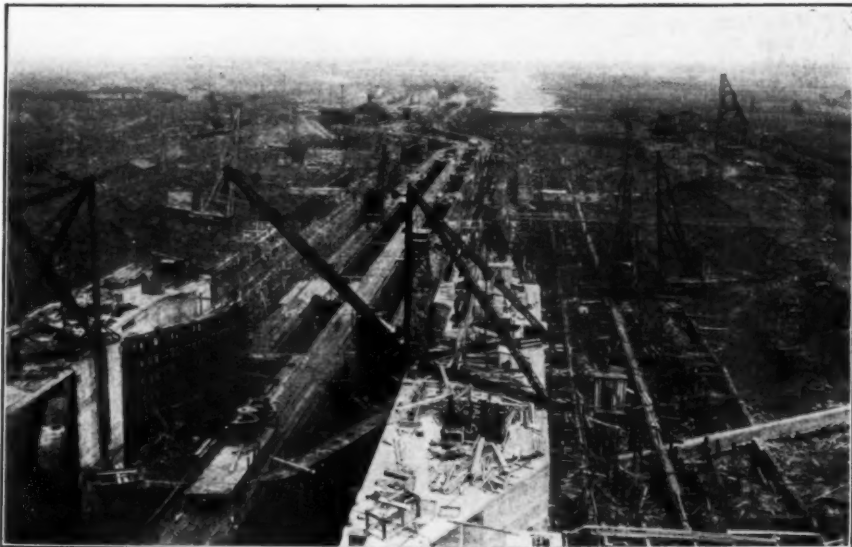
At different depths below the surface of the ground the remains of these forests are found to-day, the wood perfectly preserved by the dampness. And through this tangled mass the dredges had to fight their way.

It was a task too great for the ordinary type of 20- or 22-inch suction dredge, even with 1,000 horse-power behind it. When they met the giant stumps and trunks, they stopped. A. B. Wood of the Sewerage and Water Board, New Orleans, designed and patented a centrifugal pump impeller adapted to the handling of sewage containing trash. Learning of this, W. J. White, Superintendent of Dredging of the Industrial Canal, asked him to design a special impeller along similar lines for the dredge Texas.

Results from this invention were remarkable. During the 30 days immediately preceding the installation, the dredge had suffered delays from clogged suction which totaled

130¾ hours. During the 30 days immediately succeeding installation, the total of delays for the same reason was cut down to 71½ hours. The average actual yardage for the earlier period was 152 yards per hour, and for the latter period 445 per hour, an increase of almost 200 per cent. This was the period when the cost of labor and material began to jump. Employers were bidding against each other for men, and government work practically fixed the price of supplies.

George M. Wells, consulting engineer, in his report on December 9, 1918, to the Dock Board, summarized labor increases over the scale when the work was begun as follows: unskilled labor, 54 per cent; pile driver men, 40 per cent; machinists, 40 per cent; blacksmiths, 40 per cent; foremen and monthly, 15 to 40 per cent—an average increase of 40 per cent. Materials had advanced as follows: gravel, 72 per cent; sand, 25 per cent; cement, 10 per cent; form lumber, 70 per cent; timber, 40 per cent; untreated piles, 40 per cent; treated piles, 25 per cent. These increases, together with the expansion of the plans requiring a canal of maximum depth instead of the pilot cut of 15 feet as originally planned, the insistence of the Levee Board that levees on the back areas must be raised to elevation 30, the development of unforeseen and unforeseeable quicksand conditions in the various excavations, the requirements of railroads for bridges of greater capacity and strength than needed, the building of a power line to the Foundation Company's plant, and other expenses, besides delaying the work, made another bond issue necessary to finish the job.



A VIEW OF THE LOCK SITE FROM THE TOP OF THE BRIDGE DURING THE HEIGHT OF CONSTRUCTION



On February 26, 1919, the Dock Board decided to issue \$6,000,000 of bonds, which were sold at 96. This gave a total issue of \$12,000,000, the interest on which amounted to \$600,000 a year.

The canal as built is 5 1-3 miles long. Between the river and the lock the canal prism is 125 feet wide at the bottom, and 275 feet at the top. Between the lock and the lake it is 150 feet wide at the bottom and 300 feet wide at the top. It has been an excavation job of 10,000,000 cubic yards, a quantity which would require 500,000 flat cars, or a train more than 4,000 miles long, to carry the dirt.

By September, 1919, the canal had been entirely dredged, except for the 2,000-foot channel between the lock and the river, which was left until the last to a width of about 150 feet and a depth of 26 feet. Since then labor has been concentrated upon the locks. It requires only 26 feet of water to float a vessel carrying 6,000 bales of cotton.

#### The Siphons and Bridges

As an incident in the building of the Industrial Canal, it was necessary to create a disappearing river. Like the famous rivers that drop into the earth and appear again miles further on, the Florida Drainage Canal, which carries the city's drainage underneath the shipway, approaches to within a hundred or so feet of the Industrial Canal, then dives 40 feet underground, passes beneath the shipway, and comes up to the surface on the other side in front of the pumping-station, which lifts it into Bayou Bienvenue.

At first it was planned to build a comparatively small siphon, but while the plans were being drawn, New Orleans entered upon its tremendous development. The engineers then decided to design one that would be capable of handling the entire drainage of the city, and in April, 1920, it was finished—a siphon of steel and concrete and machinery costing nearly three-quarters of a million dollars and having a capacity of 2,000 cubic feet of water a second, or 172,800,000 a day. It was the work that presented many difficulties. First, the Florida Walk Canal had to be closed by two coffer-dams, the space between them was pumped out, the excavation made, and the driving of the foundation piling begun. Quick-sands gave much trouble. They flowed into the cut until they were stopped by sheet piling. The piles were from 30 to 60 feet in length and from 3 to 5 feet apart on centers. Forty-six feet below the ground surface—26 Cairo datum—was laid the concrete floor of the siphon.

The siphon is divided into four compartments. There are two storm chambers measuring 10 by 30 feet each, one dry-weather chamber measuring 4 by 10 feet, and one public utilities duct measuring 6 by 10 feet. These are inside dimensions. The floor of the siphon is 2 feet thick, the roof 1 foot 9 inches thick. The whole structure is a solid piece of concrete and capable of standing a pressure of more than 2,000 pounds to the square foot. Its

total length is 378 feet, and the shipway passing over it is 105 feet wide and 30 feet deep. In the public utilities duct are carried the city's water pipes, cables, telephone and telegraph wires and gas-mains.

The storm chambers will handle the rainfall of cloudbursts. In ordinary weather, the water will be concentrated through the smaller chamber, in order to produce a strong flow and reduce the settlement of sediment to a minimum. Eight sluice-gates, each 6 by 10 feet, open or close the water chambers. They are operated by hydraulic cylinders of the latest type.

For sending workmen inside the siphon to make repairs or clearing away an obstruction, there are eight manholes. Four of these measure 6 by 13 feet, two 6 by 6 feet, and two 6 by 4 feet.

It required a year and a half to build the siphon. Preparations for the structure cost more than \$250,000, and the concrete alone \$170,000. The machinery and the work of housing and installing it cost \$60,000 more.

Four bascule steel bridges now cross the Industrial Canal. The bridge at the locks weighs 1,000,000, and the other three weigh 1,600,000 pounds each. The bridge at the locks is balanced by 800-ton concrete blocks and concrete adjustment blocks. Their extreme length is 160 feet, and the moving leaf has a span of 117 feet. They are operated by two 75-horse-power electric motors, 440 volts, 60-cycle, 3-phase current, which is stepped down from 2,200 volts by means of transformers. In addition, there is a 36-horse-power gasoline engine to be used if the electrical equipment is out of order. It requires only a minute and a half to open or close the bridges.

#### The Locks

From test borings, the sliding and flowing character of the soil, and the various pressures which would have to be counteracted were computed by the engineers. These pressures were balanced with the holding power of pine and steel and concrete, and a hole 350 feet wide by 1,500 feet long was dug for the lock. Excavation began in November, 1918, and met with considerable difficulty, which, however, was finally overcome. Over 24,000 piles were driven, on which the lock was built. These piles are 60 feet long and the tips are 100 feet below the surface of the ground. In March, 1920, the work of laying the concrete began. The work was done in 15-foot sections, for only a few of the braces could be moved at one time. When it was finished, in April, 1921, the lock was in one piece, a solid mass of steel and stone, 1,020 feet long, 150 feet wide, and 68 feet high, weighing with its gates and machinery 225,000 tons, and filled with water 350,000 tons. The concrete floor of the lock is 9 to 12 feet thick, and the walls 13 feet wide at the bottom, decreasing to a 2-foot width at the top. About 6,000 tons of reinforcing steel was used in construction, and 125,000 barrels of cement.



**Construction Costs and Contractors**

The books of the Engineering Department of the Dock Board show the following unit and total figures for construction work:

Dredging, including the canal prism and the excavation of the sites of the bridge foundations, siphon and lock, averaged .2784 cents a cubic yard. The highest cost was in the lock section, from which 609,302 cubic yards were excavated at an average cost of .3796 cents a cubic yard. On the siphon and Florida Walk bridge section, including two other deep cuts, the 814,919 cubic yards excavated cost an average of .2607 cents a cubic yard. On the Louisville & Nashville bridge section, the 1,023,466 cubic yards excavated cost an average of .2363 cents a cubic yard. From there to the lake, 1,673,787 cubic yards, the average cost was

To drive the 17,000 bearing piles and 7,000 traveling piles on which the lock is floated, cost an average of 15 cents a running foot. This does not include the cost of the piling.

Construction steel cost .12 cents a pound, and erected, around 4 cents. These were standard prices.

The lock gates, weighing 5,285,000 pounds, cost \$845,600 in place. This does not include opening and closing machinery.

Three of the bascule bridges crossing the canal, weighing 1,600,000 pounds each, cost \$250,000 each, erected. The fourth bridge, near the lock, weighing 1,000,000 pounds, cost \$200,000, erected. This is for superstructure only; it does not include the foundation.

The emergency dam bridge, weighing 350,373 pounds, and its 108,256 pounds of turn-



**A DRAGLINE BUILDING LEVEE ONE MILE NORTH OF FLORIDA WALK BRIDGE DURING THE LATTER PART OF THE EXCAVATING FOR THE NEW ORLEANS NAVIGATION CANAL**

.2411 cents. Dredging costs were below the original estimates when labor and supplies were 50 per cent cheaper.

The 90,000 cubic yards of concrete in the lock cost an average of \$22.50 a cubic yard. This includes cost of material, mixing, building forms, pouring and stripping forms. Mixing and pouring, from the time the material was handled from the storehouse or pile, average \$1.20 a cubic yard. It would be hard to find cheaper concrete on a work of similar magnitude anywhere, say the engineers. On the siphon, the concrete work cost more, because it was a subterranean job, with elaborate shaping. The price there was \$35 a cubic yard, in place, including material and form work.

ing machinery, cost \$96,728, in place. Hoisting machinery cost \$40,000 more.

The eight girders of the emergency dam, weighing 90 tons each, at \$240 a ton, cost \$172,800.

Machinery for working the ten lock gates, the eight filling gates and the six capstans—twenty-four 52-horse-power electric motors—cost \$21,479, f. o. b. New Orleans.

The plant for unwatering the lock, consisting of one pump with a capacity of 15,000 gallons a minute, and two with a capacity of 250 gallons, each cost, erected, \$11,000.

The total mechanical equipment used on the Industrial Canal weighs 14,500 tons. Its cost, including power-house, electrical connections,



etc., is \$1,516,000.

Plant and equipment for building the Canal, including locomotives, cranes, pile-drivers, dredges, tools, etc., cost \$781,232. Depreciation up to February, 1921, was set at \$266,874.

Following are the contracts on the Industrial Canal, and the firms that executed them:

Lock gates and emergency dam girders, McClintic-Marshall Construction Company, Pittsburgh, Pa.; designed by Goldmark and Harris Company, New York, N. Y.

Filling gates, Coffin Valve Company, Indian Orchard, Mass.

Miscellaneous valve equipment, Ludlow Valve Company, Troy, N. Y.

Capstans, American Engineering Company, Philadelphia, Pa.

Mooring posts, Shipbuilding Products Company, New York, N. Y.

Miter gate moving machines, Fawcett Machine Works, Pittsburgh, Pa.

Motors, control boards and miscellaneous electrical equipment, General Electric Company, Schenectady, N. Y.

Bridge crane and bascule bridges, Bethlehem Steel Corporation, Steelton, Pa. Former designed by Goldmark and Harris Company, New York, N. Y.; latter by Strauss Bascule Bridge Company, Chicago, Ill.

Steel sheet piling, Lackawanna Steel Company, Buffalo, N. Y.

Hoists and cranes, Orton & Steinbrenner, Huntington, Ind.; American Hoist and Derrick Company, St. Paul, Minn.

Conveyor equipment, Webster Company, Tiffin, Ohio; Barber-Greene Company, Aurora, Ill.

Woodworking machinery, Fay & Egan Company, Cincinnati, Ohio.

Pipe, U. S. Cast Iron Pipe Company, Birmingham, Ala.

Lumber and piling, Hammond Lumber Company, Hammond, La.; Great Southern Lumber Company, Bogalusa, La.; Salmen Brick & Lumber Company and W. W. Carre Company, Ltd., New Orleans.

Dredges, Bowers Southern Dredging Company, Galveston, Texas; Atlantic, Gulf and Pacific Company, Mobile, Ala.

Cinder and earth fill, Thomas M. Johnson, New Orleans.

Levee work, Hercules Construction Company, and Hampton Reynolds, New Orleans.

Sand and gravel, Jahncke Service, Inc., and D. V. Johnston Company, New Orleans.

Cement, Atlas Portland Cement Company, the Michel Lumber and Brick Company being local agents.

Coal, Kirkpatrick Coal Company and Tennessee Coal, Iron and R. R. Company, New Orleans.

Reinforcing steel and supplies, Tennessee Coal, Iron and R. R. Company, and Ole K. Olsen, New Orleans.

Rail and track accessories, A. Marx & Sons.

Concrete mixers, Fairbanks Company.

Repairs and casting, Dilibert, Bancroft & Roos.

Joubert & Goslin Machinery & Foundry Company, and Stern Foundry and Machinery Company, New Orleans.

### The Opening of the Canal

May 5, 1923, witnessed the formal opening of this \$20,000,000 facility, which will mean much for the commerce of New Orleans and of the entire Mississippi Valley. It is a monument to the people of New Orleans who have paid for it without Federal aid, and to the contractors who performed so well and so quickly the construction of this great inner harbor navigation canal.

### Digest of Some Recent Successful Bids on Kentucky Road Jobs

Items	1	2	3	4	5
Trees and stumps .....	\$5.00	\$3.00	\$4.00	\$4.00	\$4.00
Clear and grub .....	60.00	100.00	60.00	75.00	60.00
Earth excavation .....	.51	.60	.65	.44	.56
Solid rock excavation .....	1.20	1.10	.65	.45	1.24
Loose rock excavation .....	.80	.75	.65	.78	.80
Borrow excavation .....	.51	.60	.65	.44	.58
Structure excavation .....	2.00	1.00	1.00	.75	1.20
Overhaul .....	.02 1/2	.02	.03	.02	.02
Cement rubble .....	12.00	10.00	11.00	.....	15.00
Concrete A .....	23.00	25.00	24.00	20.00	26.00
Concrete B .....	.....	24.00	22.00	19.00	.....
Concrete D .....	.....	25.00	60.00	.....	.....
Reinforcement .....	.08	.08	.08	.07	.09
Foundation excavation .....	.....	.60	1.50	.....	.....
Dry earth .....	.....	1.00	2.00	.....	.....
Wet earth .....	.....	1.10	2.00	.....	.....
Dry rock .....	.....	1.10	2.00	.....	.....
Wet rock .....	.....	1.00	1.75	.....	.....
Timber piling .....	.....	.....	3.00	.....	.....
Riprap .....	.....	.....	.....	.50	.....
Removing pipe .....	.....	.....	.....	3.44	.....
Crushed limestone .....	.....	.....	.....	2.00	2.75
18" standard vitrified pipe .....	2.80	2.50	3.00	2.60	4.00
24" standard vitrified pipe .....	4.00	3.50	3.00	18.00	22.00
Encas. concrete .....	18.00	3.00	4.50	2.45	4.00
18" concrete pipe .....	3.30	4.00	5.50	3.25	5.50
24" concrete pipe .....	4.25	.....	.....	.....	.....
Totals .....	.....	.....	.....	.....	.....
Vitrified pipe .....	\$100,187	\$217,402	\$356,172	\$243,101	\$161,786
Concrete pipe .....	96,676	212,189	362,860	239,893	159,733

1. Floyd County, 4.42 miles, Mayo Trail, awarded to Hunt-Forbes Construction Co., Ashland, Ky.
2. Johnson County, 11.297 miles, Paintsville-Louisia Road, awarded to M. A. Wheeler, Knoxville, Tenn.
3. Lawrence County, 19.618 miles, Louisa-Paintsville Road, awarded to Hatfield Construction Co., Huntington, W. Va.
4. McCreary County, 9.416 miles, Whitley City-Tennessee Line Road, awarded to Connelly Construction Co., Somerset, Ky.
5. Pike County, 8.867 miles, Mayo Trail, awarded to Sutton Construction Co., Ashland, Ky.

Cost figures tabulated from *The Scraper*.





PANORAMIC VIEW OF 1900-FOOT CABLEWAY IN OPERATION AT POGO DOS PAUS

## Engineering and Business in Brazil

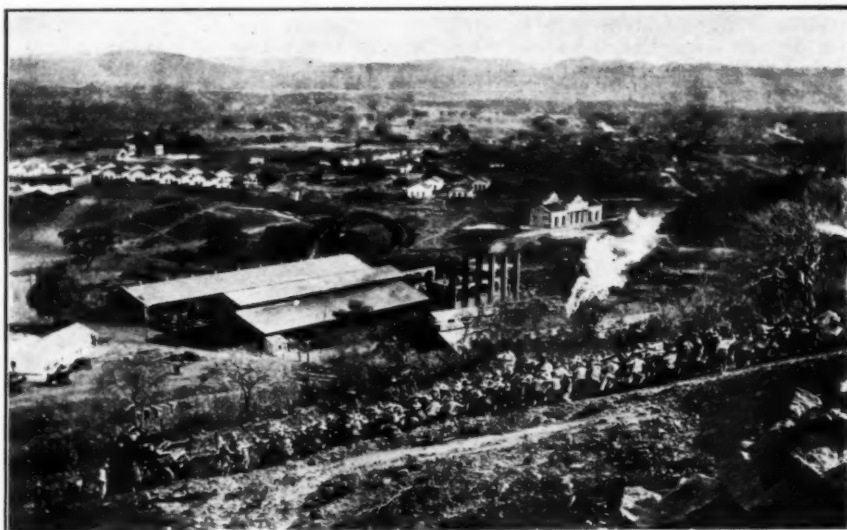
By I. W. McConnell

Vice-President, Dwight P. Robinson & Company, New York City

**S**OUTH AMERICA is too often regarded by North Americans as a small country consisting mainly of wilderness and jungle, inhabited by savages and people who speak Spanish. As a matter of fact, South America is nearly as large as North America; practically the entire area lies outside of the frigid zone and is therefore susceptible of cultivation, and the greater portion of the continent lies within the tropical zone. Brazil is the largest country in South America. Its area is about 100,000 square miles greater than that of continental United States. The official language is Portuguese.

### Government

The government of Brazil is similar to that of the United States, the Federal Government being located at Rio de Janeiro in a Federal District similar to our District of Columbia. The various states are organized somewhat in the same manner as the states in this country, but have a more autonomous government. The President of Brazil is elected every four years and cannot succeed himself under the Constitution. This condition leads to changes of policy more or less drastic with each succeeding administration. The last administration was headed by a man of great vision and courage



PANORAMA OF POGO DOS PAUS, BRAZIL

This photograph shows 250 men drawing the hoisting engine to the top of the hill near the head tower. In the background can be seen the machine shop, warehouse, newly constructed railway station and camp for employees and laborers



who did not hesitate to use the credit of the country to push forward internal improvements. His policy has been much criticized, on the ground that the credit of the National Government had been overextended and the funds arising therefrom injudiciously expended. There has been some gossip in recent months respecting the ability or purpose of the Brazilian National Government to meet its obligations. The present administration, which came into power on November 15 last, definitely pledges itself to the maintenance of the credit of the country and to the adjustment of its financial affairs. Performance to date indicates that the pledge will be kept.

#### The Arid Section

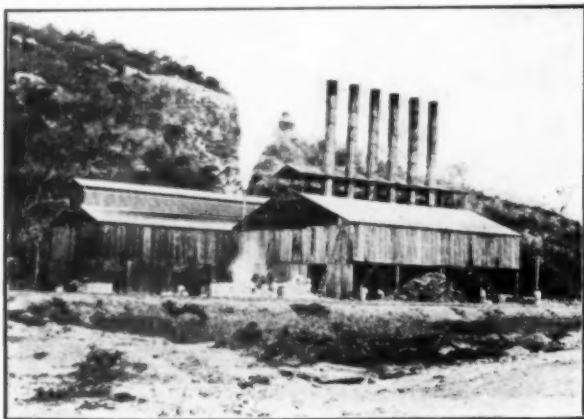
The common conception of Brazil is that of a country of jungles and heavy rainfall. This conception is correct of a great portion of the area, particularly the valley of the Amazon and of the other great rivers which drain the country. In northeastern Brazil there is, however, an area, perhaps equal to that of New England, New York and Pennsylvania combined, which has clearly defined wet and dry seasons, the climate resembling in many respects the summer climate of southern Arizona and California. The dry season lasts ordinarily for seven months and ends in December or January. At the time the rains begin, the food and other crops are planted. The seeds germinate quickly under the influence of moisture and the tropical sun, and the crops mature before the rainy season is over. The dry season which follows is almost totally devoid of rainfall. The rivers which are on steep gradients quickly run off all surface waters, and the only water-supply remaining is that in the sands of the river beds or in the pools along the river courses or in artificial reservoirs. The rainfall is extremely variable as to amount, rate of precipitation, and time of occurrence. The heaviest rainfall is in excess of 60 inches per annum, the lowest of record is 10 inches. The normal year may be said to

have a rainfall of approximately 30 inches, which is precipitated somewhat uniformly over a period of four to five months. The crops of the country are cotton, mandioca, beans, corn, the common fruits and vegetables of the region, and the products of an extensive pastoral industry.

At irregular intervals there is a year of very short rainfall, insufficient in amount to germinate the food and other crops, and a famine ensues, resulting in the death of many people from starvation and the diseases attendant upon famines, in the destruction of herds and the disorganization of business and social life. These droughts are extremely severe and occasionally extend over more than one wet season; that is, two wet seasons in succession may have a severe deficiency in rainfall. Such an event transpired in 1878-79, at which time out of a population of over 1,000,000 the state of Ceara lost 300,000 through death or migration; over 95 per cent of its herds were destroyed, and a complete disruption of business affairs followed. The consequences were so frightful that the National Government, under the leadership of the last Emperor, ordered a scientific study made, with a view to carrying out relief measures. These measures were carried out spasmodically and with little practical effect until in 1919 President Epitacio Pessoa secured the passage of an enactment by Congress, authorizing a credit of 200,000 contos and setting aside 2 per cent of the general revenue for the construction of reservoirs and other construction works for the relief of this section. Under this legislation three contracts were let to foreign contractors for the construction of reservoir dams.

The contract of the American firm, Dwight P. Robinson & Company, Inc., calls for the erection of five dams. The dam at Poco dos Paus is designed to be over 60 meters in height and over 600 meters in length at the crest. This work has been served from the beginning by railroad transportation and is the farthest advanced of any of the projects. The masonry content of the dam will be in excess of 600,000 cubic meters. It will be built by a plant of modern construction machinery, consisting of concrete machinery, rock crushers, screens, sand-reclaiming apparatus, derricks, cableways, power drills, machine shops, and all the other appurtenances going to make up a modern construction plant for dam work. All of the construction machinery is operated by electric motors deriving power from a central steam-driven station, fired with wood fuel. The active work on these contracts began in June, 1921.

A conspicuous item of the mechanical equipment is a cableway of 10 tons ca-



EXTERIOR OF WOOD-BURNING POWER-PLANT AT POCO DOS PAUS



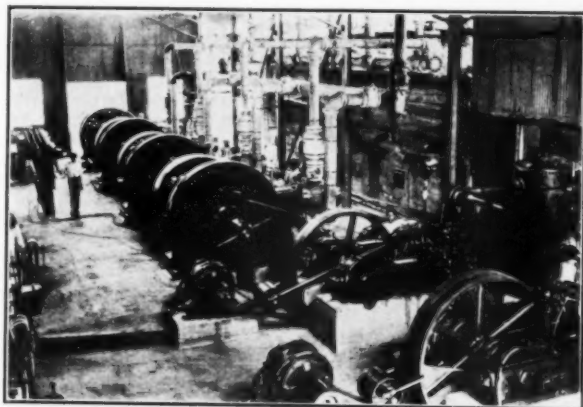
capacity, with a span of over 1,000 feet, mounted on steel towers about 135 feet in height. This cableway is said by the Lidgerwood Company, the manufacturers, to be the longest single span erected for this class of work. The reservoir at Poco dos Paus will have a capacity of more than 800,000 acre-feet. This reservoir is located on the upper reaches of the Jaguaribe, and will water the lands lying between Poco dos Paus and the great reservoir of Oros.

The Oros reservoir when completed will be the greatest artificial reservoir in the world, having a capacity of approximately 3,500,000 acre-feet. The next largest is the Elephant Butte reservoir on the Rio Grande River in New Mexico. The dam at Oros closes a narrow gorge, where the river has broken through an intersecting ridge. The dam will be about 55 meters in height and will contain 300,000 cubic meters of masonry, more or less. The length at the crest will be approximately 450 meters. On account of the great volume of water stored and the location of the dam at the crest of a 90-foot cataract in the Jaguaribe River, it may be possible to develop local power requirements at this dam site. In the main, however, the power possibilities of the developments proposed would be of minor value on account of the intermittent character of the production. The throat of the gorge at Oros, at which point the dam must be located, is occupied by a permanent pool in the river more than 30 feet in depth. It is proposed to drain this pool through a tunnel, after which the low flow of the river can be diverted around the construction operations, giving substantially a dry river bed to work in for a period of six or seven months in each year.

At Piles it is proposed to erect a dam 20 meters in height to create approximately 3,000,000 cubic meters of storage space. This reservoir will serve the territory in the vicinity of Sao Jao de Rio Peixe.

On the main stream of the Piranhas River a great reservoir will be erected at the location known as Boqueirao de Piranhas. This dam will have a height of approximately 50 meters and will create a storage capacity not yet accurately known, but of approximately 1,000,000 cubic meters. The water from the reservoir will be discharged into the Piranhas River and will flow to a dam to be erected at Sao Goncalo, where it will be diverted into irrigation systems covering that portion of the plains of Souza. The storage capacity at Sao Goncalo will be about 100,000,000 cubic meters, the principal purpose of the dam being that of diversion.

The engineering problems involved in this work are not unusual, except as they must be



INTERIOR OF WOOD-BURNING POWER-PLANT AT POCO DOS PAUS

designed to overcome the conditions existing in the country. At the outset of the work, all the dams except that at Poco dos Paus were remote from railroad transportation. Ever since the inception, all material for Sao Goncalo and Piranhas has been transported over highways in motor trucks, a distance of 125 kilometers from the railroad station at Lavras. During the greater part of the year the roads are dry and require only surface operations to be kept in operating condition. The soil of the country makes fairly good roads for the conditions prevailing. When the rainy season sets in, however, the roads become impassable in a short time. Climatic conditions are not exceptionally severe, although a high average temperature prevails. The maximum temperature is not excessive and the low humidity of the atmosphere makes the climate an agreeable one.

The advent of automobiles, motor trucks, and ice-making machines was a revelation to many of the inhabitants who had never seen these facilities before. One of the great tasks of the men in charge has been the utilization of native labor, wholly untrained in the possibilities, advantages, and dangers of high-speed power machinery. The erection of plain houses with brick walls and cement floors, together with a supply of filtered water, and the other precautions against disease due to filth and vermin, gave rise in some quarters to the rumor that the Americans were extravagant. A number of reports have been made on the work by national officials, and one survey in November, 1922, by a commission headed by the celebrated General Rondon, reported the work of the American contractor in good shape, well centralized, carefully planned, and ably administered. To as great an extent as conditions warrant, Brazilian engineers have been inducted into the work, and in the course of time should be competent to take over the entire administration of the construction forces.

ACKNOWLEDGMENT.—From an address before the annual meeting of The Harvard Engineering Society, New York City.



## Keep a Pictorial Record

When Its Value Is Fully Recognized, There Won't Be a Job Without Its Family Photo Album

ONE has to imagine a world without photography to realize the tremendous influence which the camera exerts on the lives of all of us. And only thirty years ago the Kodak and film photography were born. From the exclusive possession of the studio professional, or of a few devotees whose enthusiasm and technical equipment were equal to its difficulties, photography has become the easily obtainable possession of every man, woman and child on earth.

Even to-day we have scarcely begun to realize its possibilities and to apply it to their fulfillment. Because of its simplicity it is able to enter into every activity of life. Photographs are the only substitute for the subject itself.

Publishing, advertising, selling, education, law, and a host of other factors in our daily life have all been advanced by the camera. The salesman who could not move at one time with less than half a lorry of trunks now carries an album of photographic samples in his hand. Some representatives even carry a Kodak for the purpose of snapping window displays, shop interiors or other scenes interesting to their firms. Safety work in factories and the education of operators is also furthered by pictures.

The construction industry is one in which photography can and does play a highly important part. The old idea of taking a photograph when the building is completed has given way to the modern idea of taking photographs of each step in the construction process. A photo taken at regular intervals furnishes its own comment on actual work done; a series of photos gives a far more graphic report of progress than the best written statement obtainable. And pictures do not lie. The photograph with the date written on the film is an accurate picture of work completed on that date. Disputes are eliminated, a check is obtained on efficiency, time estimates are easily made, and each step of the work is readily studied for its many lessons. It requires little imagination for owner, architect or contractor to perceive the many applications of the camera to any building operation and its advantages over other methods, not only for present uses, but for future ones as well.

Architects, engineers and contractors, for instance, can keep photographic records of tunnel construction, bridge work, industrial buildings, and, in fact, all work completed and in progress to show prospects. The foremen can present a pictorial record of progress to their



WHEN THE POSSIBILITIES, ECONOMY, AND EFFICIENCY OF THE PICTORIAL RECORD ARE FULLY RECOGNIZED, IT WILL BE AN UNCOMMON THING FOR ANY PROJECT TO BE COMPLETED WITHOUT A PHOTOGRAPH OF EACH STEP OF THE WORK





THE MAN WITH A CAMERA GUARDS AGAINST "COME-BACKS" WITH AN ACCURATE RECORD OF HIS JOB

superiors. The owner and his associates can be kept informed of the state of the job and will have a clear idea of its status whether they are actually on the ground or not. As many prints as are required may be quickly and cheaply made and placed in the hands of all interested parties.

Stocks of lumber, materials, equipment, and men, may all be photographed and become part of the valuable record. When it is impractical to keep tracers on the track of a car of lumber

or materials from both terminal points, a photograph of the car may be taken before shipment and forwarded to the consignee. The picture shows the car number and initial, and besides establishing fact of shipment furnishes convenient data for location—which in these days of uncertain transportation is very desirable information.

ACKNOWLEDGMENT.—Text and illustrations by courtesy of "Sterners Stuff," the E. J. Sterner Company, New York City.

## The Venturi Meter in the Filtration Plant

THE accompanying diagrammatic layout of a typical rapid sand filtration plant assumes the source of raw water to be a river or lake from which the supply is pumped by the low-pressure service pump, or flows by gravity to a sedimentation basin where the turbid water is partially clarified by the gradual settling of suspended matter. The Venturi meter (1) on the main supply line gives an accurate accounting of the total raw-water supply and all variations in the rate of supply. It also serves as a constant check on pump performance, giving immediate warning of broken, roughened or clogged impeller vanes, worn valves, leaky plungers or other defects in equipment or operation. Occasionally certain chemicals, such as lime or iron, are added to the water and increase precipitation.

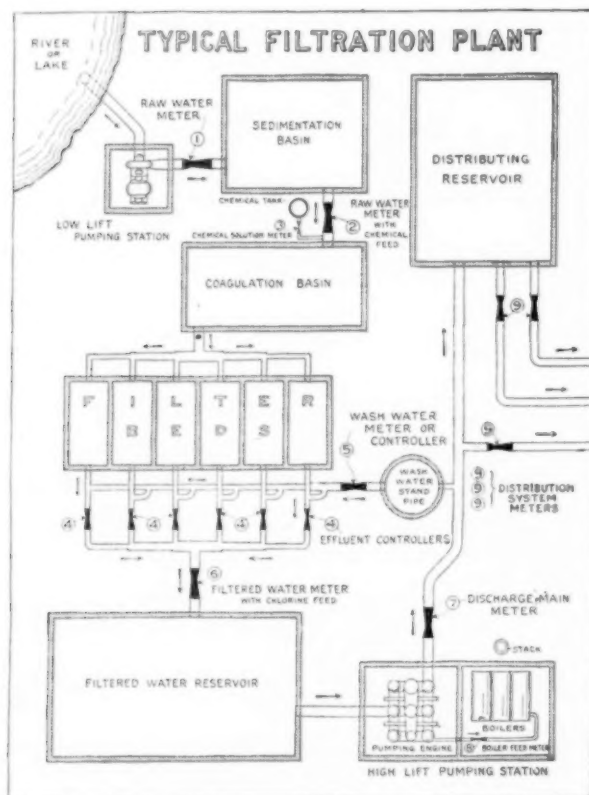
From the sedimentation basin the water passes through the second meter (2) to the coagulation basin. During its passage the water is chemically dosed with alum or iron, milk of

lime, soda-ash, etc., for promoting filtration by the formation of floc, which is caught by the filter-bed sand. A meter at this point reveals the hourly rate of flow to the coagulation basin, and by comparing its readings with the raw-water meter, shows the loss of water by leakage or evaporation.

From the meter readings at 1 and 2, the application of the chemicals can be properly maintained through manually regulated orifice tanks or by an automatic chemical controller operated by the meter itself.

In larger filtration plants, it is often advisable to place a meter on each feed line (3). The importance of keeping the supply of chemicals, whether manually or automatically controlled, under accurate regulation to insure proper treatment and to avoid waste, is universally recognized. The daily information and records of the Venturi meters thus become of great value in at once revealing improper conditions of operation.





A DIAGRAMMATIC REPRESENTATION OF A TYPICAL WATER PLANT AND DISTRIBUTION SYSTEM, SHOWING LOCATION OF VENTURI METERS FOR EFFECTIVE OPERATION

After coagulation, the water is admitted to the filters. In slow sand filtration plants, manual control of the main valve is practical. Hence a plain Venturi tube set in the effluent line from each filter and connected to a suitable loss-of-head and rate-of-flow gage forms a combination for accurate guidance in proper filter operation. The advent of the rapid sand filtration plant brought with it, however, an immediate demand for automatic rate control of the filter effluent. In this case the Venturi effluent controller may replace the simple meter in the effluent line for each filter (4). As the sand-bed becomes clogged, the loss of head increases and the control valve gradually enlarges its opening, until finally a wide-open position is reached.

The need of controlling the rate of wash of filters, so as to prevent an unduly high rate, with consequent loss of some of the upper sand layers, is fully recognized. Either a self-contained or a diaphragm type of Venturi controller may be placed directly in the wash line and the rate set on the scale beam, thus insur-

ing safety in washing filters.

From the filter-beds the water is delivered to the clear-water conduit or reservoir. At this point (6) final sterilization may be necessary by the use of liquid chlorine. It is particularly essential that the rate of feed be in close proportion to the rate of filtered water to insure proper bacterial results and to avoid overdose. A Venturi meter is usually used as a controlling device for connection to the automatic chlorinating apparatus.

A high-service pumping-station is usually required to send the filtered water to a distribution reservoir, from which it flows by gravity to the city. In some localities the water is pumped directly into outgoing mains which have a common connection to a stand-pipe which "floats" on the system. One or more Venturis are needed on the discharge line (7) from the high-service pump, which may be either of the reciprocating or of the centrifugal type. Here the meter accounts for the daily output of filtered water, which can be compared with the daily input of raw water, disclosing the gradual, but none the less serious, increase of slip on the pumps, as the pump valves become worn or broken.

A complete power-plant in connection with large filtration plants is often warranted. The power-plant may prove a source of expense rather than an economy, however, if proper instruments are not used to guide operation. It is of special importance that the performance of the boilers be constantly watched and a meter placed on the boiler-feed line which not only gives the total pounds of water evaporated but immediately points out inefficiency in feed water control, and in numerous other ways serves as a thoroughly reliable guide in the work done by each boiler up to a maximum.

The importance of placing Venturis on all outgoing distribution lines (9) has been emphasized repeatedly, since in no other way can exact knowledge be obtained of the day and night and the demand of the various districts, reservoirs and stand-pipes.

The layout of a typical filtration plant is published through the courtesy of Builders Iron Foundry, Providence, R. I.



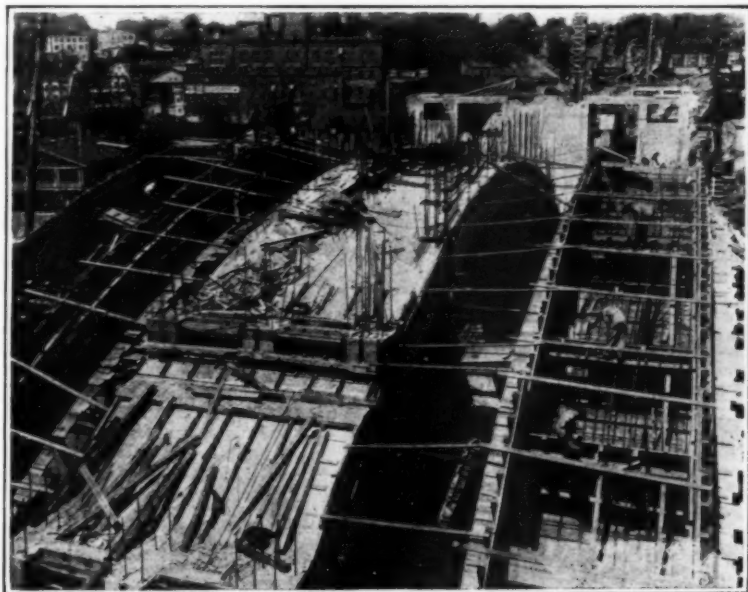
# The Georgetown Bridge Over the Potomac

Six Years' Work Completed and Bridge Opened to Traffic

ONE of the finest concrete bridges in the country has recently been completed in the District of Columbia, where it will be used as an improved artery of traffic between the District and Virginia, for it replaces an historic old structure which has served its period of usefulness and has been condemned. The new bridge, which is called the Georgetown Bridge, with its approaches, is 2,700 feet in length and 70 feet wide and is approximately 85 feet above the Potomac River, which it spans. It is one of the largest structures of its kind in the United States and provides a central runway for two street car tracks, as

Ohio, the Aqueduct Bridge was built, between 1832 and 1840, to serve as a combined roadway and aqueduct for carrying the canal across the Potomac River at Georgetown. The United States Government purchased the aqueduct in 1886 and several years later remodeled the bridge and converted it into an iron deck truss structure. Since that time it has served as one of the most important highways into Virginia from the District of Columbia.

For several years previous to the inception of the concrete bridge project, the old Aqueduct Bridge had been unsatisfactory. The pier foundations had given considerable trouble, and



THE GEORGETOWN BRIDGE IS CONSTRUCTED ON A FRAMEWORK OF STEEL WITH A MAXIMUM OF REINFORCEMENT TO STRENGTHEN THE CONCRETE

well as two 16-foot roadways and two walks, each 8 feet wide, for pedestrians.

The old aqueduct bridge which the Georgetown Bridge replaces was built 80 years ago. In the early days Georgetown was a port of considerable prominence, and ships from all parts of the world plied the Potomac, with Georgetown as the trade terminal of their commercial activities. Subsequent to the construction of the Chesapeake and Ohio Canal, which George Washington designed to serve as a channel of easy communication between the Atlantic Coast and the rich inland valleys of

every time much ice was formed in the Potomac, there was great danger that the bridge would be seriously damaged and traffic over this roadway prohibited.

## The New Bridge

The new bridge is thoroughly modern in all respects. In the first place, the barrel or arch ring is built in three parallel sections, each of the outer sections being one-half the width of the center section. In this respect the bridge differs from the earlier masonry arches, in which it was customary to build the barrel as



a single structure, whatever the width of the bridge might be. The space between the rings and the level of the bridge floor is spanned by reinforced concrete slabs. This method of construction results in a great reduction in the weight of the barrel and of the whole structure.

A series of spandrel arches are substituted for the solid spandrels which characterize earlier arched masonry construction. These arches are carried upon piers which are erected symmetrically upon the barrel. The arch rings and the spandrel columns are tied together by lateral reinforced concrete diaphragms.

The result of this skeleton construction is the great reduction in the dead weight of the structure and therefore in its cost in materials and labor. In building the bridge, the steel reinforcement arches were erected upon a huge wooden false work which was built on two scows fastened side by side and then floated into place between the piers when the tide and

current were exactly right for the operation. After the steel structural work was in place, the concreting proceeded.

A novel feature of the construction work was the installation of a complete concrete mixing plant upon a large scow which was shifted to different points on the line of the bridge as construction progressed. It was equipped to deliver one cubic yard of concrete a minute to the bridge, and a heavy cableway which extended from Virginia to the District of Columbia was used to convey the buckets of concrete from the scow concreting plant to the desired spot for pouring.

Work on the bridge began six years ago when Congress appropriated \$2,100,000 for its construction. The work was done under the active supervision of the Corps of Engineers, U. S. A.

ACKNOWLEDGMENT.—Text and illustration by courtesy of *Scientific American*.

## Prehistoric Road Building

### And How One Style Started

IT was back in the prehistoric age. Two heavyset men came down the road talking loudly. Said one: "He can't do it for the money. His actual costs will be more than that. I have all the figures right here in the cart." He stopped, and a cart came up, drawn by a mastodon. He climbed up and commenced unloading flat stones, which he spread out side by side. Chiseled on them were hieroglyphics. Turning to his companion, he continued, pointing at the stones, "There are the actual cost figures, and, besides, he is going to use a dinosaur, and you know they ain't worth a darn except in wet weather."

#### The Engineer

As the town contractors stood airing their grievances, they noted coming down the road a queer human. Somewhere, somehow, he had gotten hold of two pieces of mica, which were held together with a bone, and which sat on his nose in such a position that he could look through them. The skins he wore were all dyed yellow, and he had made himself some queer foot-gear that came to his knees and was laced with deer thongs. Coming close to the contractors, he set up something like a three-legged stool, on top of which was perched a long narrow, open gourd. Reaching in his pocket, he took out a stone with a leather string tied to it, which he fastened beneath the legs. Then from another gourd he filled the gourd on top, which he carefully leveled, after switching the three legs so that the swinging stone set over a place scratched on the road. After he was all set, a man driving two mastodons in tandem hit one of the legs with a wheel. Did he cuss? No, he was an engineer.

#### The Cement Salesman

Presently another specimen of the genus *homo* strolled into the group. He was won-

derfully and fearfully arrayed in a suit of black beaver, with a vest of otter skin dyed purple and further set off by a marten's skin, beautifully red, for a necktie. By his side was his wooing hatchet, with seventeen notches cut into the flinty stone. One could tell at a glance he was a cement salesman.

#### It Was a Her

Enter another personage on the scene. It was a her. She had a dress that was almost a bear skin. She had a bracelet of boar tusks, highly polished, to which was suspended a sun dial. She had a bag made of cat skins, and would, from time to time, reach in it, and, extracting a piece of talc, would rub her nose with it, looking into a small bucket of water which she carried at all times for her mirror. She was perpetually chewing on some beeswax. She was a stenographer.

She created a sensation. The material man slipped behind her and brought down his wooing club with full force, but she never even batted an eye. A contractor lifted one of the stone tabulations, and, climbing a tall tree, dropped it full upon her head. It merely disarranged the hair, making it fall over one ear. She loo'd in the bucket of water and then pulled the hair down over the other ear. (That's how the style started.)

#### A High-Brow Falls

Not for nothing had the engineer burned the midnight oil. Truly, he was a "high-brow." He walked in front of her, casting rather a contemptuous glance upon her, and yet tempered with superior indifference.

Scarcely had he passed her than quick as a flash she picked up the wooing club dropped by the material man, and, in a moment more, the engineer sank to sweet unconsciousness in the stenographer's arms.—*Trap Rock Chats*.



## Clippings for Contractors

### Those Who Plan and Build

**F**AITH is the basis of progress. A man must have faith in himself, his neighbor, his city and his country if each of them is to prosper and go forward. That sort of faith which causes an individual or an organization to preach community spirit, the merits of local products and above all the competency of its architects, engineers and contractors, is beautiful to contemplate. But when this evidence of faith is broadcasted throughout the land 364 days in the year and on the 365th day, the community spirit, or whatever it is that causes sudden conversions to the detriment of the community, brings its architects, engineers and contractors from afar to do that which local technical men are better qualified to perform, the ordinary mortal wonders why. He also wonders why it is necessary for local concerns and individuals, ready and willing to supply that which is necessary in building a representative structure, to be compelled to fight and bring to bear all the influences at their command, that they may have even a small part in the construction of that for which their money is helping to pay.

—*Pacific Builder and Engineer.*

### Rendering Service a Business for Engineers

**T**HROUGH his knowledge and training the engineer is particularly fitted to render service for the public welfare; but, being largely a creature of tradition, he is inclined to be exasperated by incompetence and ignorance and to fail to grasp the significance of facts not related to engineering. He looks upon commercial activities with distaste, not infrequently labeling business a "money-grabbing game." What the engineer fails to realize is that conditions now existing in our industrial civilization require his services, that he is under a heavy obligation to improve the civilization his engineering activities have produced, and that the only possible outlet for such services is through business channels. Engineering activities are really business activities, and the only touch with the public that can be maintained by the engineer is through the business contacts of his engineering operations.

The best salesman is the man who knows his product, and the engineers, therefore, should sell engineering service to the public if they are to develop and become an agency for the improvement of the national life. There is too much loose talking about water-powers, transportation facilities, aviation, radio and other engineering subjects by politicians, lawyers, business men, economists and village gossips. If their imaginations are allowed to run wild, such men will hypnotize themselves

into believing that their conjectures are facts. This is all wrong. Engineers must become publicists and must bring home the engineering side of these things to the public as business facts. Every engineering argument can be reduced to an economic fact or phrased in a popular manner which can be grasped by the public. If put forth by men who know whereof they speak and who are capable of stating it in a way dictated by business sense and a knowledge of mass psychology, these statements will carry conviction and belief.

—*Electrical World.*

### Avoiding the Evils of Cheapness

**I**T is always wise to practise true economy. Wild extravagance, spending money for things that are quite unnecessary, or buying anything in preference to some other thing simply because it costs more, is never a sound policy. But it is as great a folly to do without things that are essential or to buy things simply because they are cheap.

A passion for cheapness seems to have taken hold of some people. They seem to be willing to buy anything that is very low in price regardless of its value. Wherever there is a demand for low-priced goods, there are usually some unprincipled firms who will take advantage of the fact that these people know little about quality, and furnish them the goods that are really worth far less than even the low price they demand. Low prices do not necessarily mean economy. In fact, buying on a price basis alone usually proves very expensive.

The average person knows little about cloth, leather, food, fuel, heating equipment, plumbing, or other essentials. He leaves that to the dealer in those things, and therefore is fairly easy prey when he goes in search of cheapness. He will eventually learn that he has been deceived, but it is an unpleasant and unprofitable experience to go through.

Beware of the man who has something cheap to sell; examine his goods thoroughly before buying. If through increased efficiency in production and marketing, and a willingness to take a small margin of profit, he is able to offer you a good article at a moderate price, then he is entitled to your business, but cheapness alone is a very unsafe characteristic to be governed by.

—*Domestic Engineering.*

### Certified Checks on Private Work

**I**T is said that in a number of recent instances private owners in requesting bids on work have asked for certified checks.

Perhaps the owner would have sufficient justification for this practise if he were to offer a reasonable guarantee that the work



would be let to the lowest responsible bidder at the figure submitted in the bid.

If he were to throw the opportunity for bidding open to all comers, merely demanding that the bidder shall be responsible, or if he were to restrict the field of bidders to certain firms of whom he personally has knowledge, and in whom he has confidence, the practise would be fair enough in either case—providing that the owner on his part guarantee that the contract will be let to the lowest responsible bidder, protecting himself, if he wishes to do so, by a provision that the accepted bid must not in any case exceed a preannounced figure.

But if the owner on his part will not submit to any such guarantee, but retains the right to "shop around" for lower bids, at the same time holding the check as a guarantee that the contractor shall proceed with the work if it is offered to him at the figure he bids, under penalty of forfeiting the check, he is exacting an unfair condition. He is binding the contractor to stand fast to his bid, while he binds himself to nothing.

It costs a contractor considerable money to figure a job and submit a bid. Obviously, no contractor would go to the trouble and expense involved in the submission of a bid unless he expected to have a fair competitive chance to get the work. He does not bid for the mere fun of bidding. Incidentally, it may be said that no owner ought to ask, or permit, any contractor to submit a bid having in his mind a determination not to give that contractor the job. Owners sometimes permit certain contractors to figure—occasionally request them to figure—jobs, with the predetermination not to give them the work, even though their figures be the lowest. The owner may accept their bids either because he dislikes telling the contractors flatly and openly that they would stand no chance, and that the field of those who would be seriously considered is restricted to a favored few—or because he wants a number of bids from outside the pale, in order that he may check those he regards as serious competitive contestants and use the outside bids as a lever to force down costs. In either event the owner's attitude is distinctly unfair to the contractor.

In the second place, no owner has the right to exact any unusual or burdensome condition upon bidders, such as the exaction of a certified check with the bid, unless he is himself willing to assume certain definite obligations to offset the added burden.

—*The Improvement Bulletin.*

### Master Must Employ Man

**"I**F a master painter secures a job to paint a house, barn, or fence, he cannot work on the job himself, unless he is accompanied by a union painter at \$1 an hour."

"If a member of the union secures a painting job, he can do it himself without the compulsory aid of a brother painter."

The above sounds like the swing and sober rhythm of a translation from the Code of Hammurabi, about 2,000 B. C., but it is merely

the announcement of a recent regulation made for our fair city of Lynn, Massachusetts.

It needs no further explanation, because having assured you that it is present-day news, it sounds all too familiar.

But think of the consternation which will be caused 4,000 years from now when some learned savant digs up the remains of some present-day painter petrified through his own inaction on the job, and finds gripped in the stone-turned hand the above pronouncement. "What does it mean?" he will cry, "that the master could not work alone in those backward days? Can it be possible that those ancient journeymen were dictators to the masters? If so, why the master?" Then the savant will issue his opinion and later be stricken with painters' colic for having insulted the so-called scaffold or outer soul of the union paint applier.

—*The American Contractor.*

### How Can We Stop Duplication of Orders?

**T**HE building industry is suffering from duplication of orders. To insure the receipt of materials, contractors and dealers, fearing a shortage, are ordering double and treble the quantities they will actually require. The result may be, before long, serious "apparent" shortage of materials, with consequent additional price increases. Thus there will be further discouragement to building, to the detriment of the public and of the construction industry.

But it is not only the consumer of building materials that suffers. The manufacturer also is a victim. If he takes the full face of orders as *bona fide*, he is now believing that he is well sold up for the season. Nevertheless, when the expected time of heavy shipments arrives, he will probably receive heavy cancellations, with the result that his piled-up stocks, carried usually with the assistance of bank loans, will be left on his hands.

Both consumer and producer, therefore, suffer from present practise. What is the remedy?

The seat of the trouble lies in the form of order for the purchase of many building materials and in the accompanying trade practise. This form of order is called a "contract," though in its use it is a travesty on that respected form of legal document. A contract implies mutual advantage or concession. In the alleged "contract" for buying building materials the manufacturer guarantees not to raise the price. That should be sufficient concession from him; that is the advantage which he surrenders to the purchaser. But on top of that he guarantees to give the purchaser the lower price in case the market declines and then—concession of concessions—in actual practise permits the purchaser to cancel without any penalty whatever.

In return for these concessions, what does the purchaser agree to do? Absolutely nothing. He is protected in price against both rise and decline. Under trade practise he may cancel



if he wishes. The advantages are his; the risks are the producer's. There is no mutuality. The "contract" in fact, is not a contract; it is an option, giving all advantage to the buyer and imposing, as the trade construes it, no obligation.

Mutuality would certainly demand that the intending purchaser, in return for price protection, should guarantee to take the material in accordance with the terms of the order or incur a financial penalty for cancellation.

In other words, a non-cancellable form of contract, or one carrying financial penalty for cancellation, would be a contract in the true sense—in that it would impose reciprocal obligations. It would hold forth definite advantage to the buyer; it would insure the producer against cancellation.

At this very time, everyone in the construction industry is fearful that rising costs will start a serious retarding movement in construction. It is an opportune time for the industry as a whole to eliminate features that encourage inflation. A good start would be made by adopting a fair materials purchase contract—a contract that would be in reality a contract, in which both parties would have obligations and advantages.

—*Engineering News-Record.*

### The Inevitable

**P**OLITICS have made a mess of this year's road-building program in several of the states which have been in the front rank of the better highway movement of the country. In some states the upheaval is merely due to a change of party control. In others

the present outlook might appear to indicate a permanent retrenchment policy. There also has been a lot of loose talk about the bad economics of building durable surfaces on even the trunk line highways of several densely populated states.

All this was inevitable. Our highway program has become the biggest constructive work the nation has ever undertaken. On the whole, it has been a clean job—remarkably clean. Politics have been unable to dig up crooked work anywhere. The opposition to the highway movement has received its main support on the question of the expediency of spending so much money now for roads to carry a traffic that the wise among them confess seems to have no limits.

That strong support was forthcoming last year for any plan which would appear to reduce taxes was natural. But the swing in a few states to those opposed to highway building was nothing more than a swing. Even in some of these states, the opposition argued merely for slowing down on new work for a while; none tried to stop highway building altogether.

To those living in the states where highway work has been more or less checked temporarily, the outlook may appear serious. Taking the country as a whole, however, the setbacks are purely local. The demand for more and more roads apparently must be met. Road building on a tremendous scale for several years seems just as inevitable as is the hindrance from politics which the movement lately has met here and there.

—*Successful Methods.*

## New Use for an Old Standby

**T**HE mythical steam shovel operator who could comb his hair with the bucket, and dress himself with the boom, has met his match in Worcester, Mass. This modern genius, confronted with a problem in hydraulics on what had looked like a nice dry job, promptly proceeded to handle it with the only implement at hand—his shovel.

Streeter and Sons had taken a contract to excavate the basement for the new home of the Hadley Furniture Company of Worcester. The steam shovel had been working as well as could be expected—considering that it was called upon to handle bricks, rocks, debris, lumber, sticks, and an occasional chunk of earth, and that the roadway had cut so deep that the truck drivers were having trouble to back up far enough for their loads—when suddenly a regular cataract came pouring out of the bank.

"Nother water pipe busted all t'ell," growled the operator—but he was wrong, fortunately. Only an old well, built a century ago, probably, and now making its final appearance and trying to drown out the job. No one had known it was there, as more than a foot of earth had gathered on the old cover; but the sharp teeth

of the shovel had found it, and had punctured its casing or, rather, had caved in some of the rocks which had been laid as a lining by men now forgotten.

The operator looked things over, fortified himself with a fresh chew, and then started to put that well out of business. A pile driver engineer would have envied the way in which the bucket was raised high in the air and then brought down hard on the old wall. Stones rolled in all directions, and water spurted into the basement and ran out into the street, but still that shovel hammered away.

When the operator had things down to grade, he reversed again, and used the bucket as its maker had intended. Rocks and dirt were picked up and dumped into the hole. The final loads were tamped down with the bottom of the bucket. Then the operator dug the hole down again, about 3 feet below grade, and filled in once more with nice dry dirt. The job was soaked, but the sun will soon dry it out, and the road was in just a little worse condition than before. A bad job had been done economically and efficiently, thanks to the ingenuity of a steam shovel man.

—*The American Contractor.*



## A Cableway Solves a Road Builder's Problem

Unique Construction Job Shows Economy of Special Equipment

**I**N the construction of a roadway in Woodlawn Cemetery, New York, it was necessary to build across a 300-foot swamp. Ordinary equipment would not handle the road material, and wagons would have sunk to the hub in muck and mire. The contractor, Fred R. Diering, looked into various material-handling methods and finally decided on the use of a cableway. The versatility of the cableway was shown in that the next section of the road was just the reverse of a swamp—a knoll, so that the cableway was brought over the hill, taking care of the material as expeditiously as it did in fill.

The cableway is of 2½-ton capacity with a 300-foot span. The towers are of the A-frame type, 30 feet high, with legs made of 8 by 10 timber and cross-braces of 2 by 10 lumber.

The sheaves in the tops of the towers are 20 inches in diameter, with two 3/16-inch pins bronze-bushed and lubricated by compression grease cups through the center of the pins. The cable used, furnished by the Waterbury Rope Company, consisted of a 1½-inch crucible steel main cable, a ¾-inch hauling line, and a 9-16-inch-diameter hoisting line, both of crucible steel.

As the cableway was sometimes used with a scraper bucket, the towers were subjected to an unusual strain, so that tower guys were made of 1½-inch diameter galvanized iron. The anchorages were about 60 feet back of the towers, as shown in the accompanying illustration. The front cover illustration of this issue of *CONTRACTORS' & ENGINEERS' MONTHLY* shows the contractor's dump bucket being emptied into a wagon.

The carriage on the cableway was of the four-sheave type, designed especially so that when used with a scraper bucket, the tripping action would be counteracted. The hoisting block was a 20-inch single sheave with check



**FULL SWEEP OF THE 300-FOOT CABLEWAY USED BY THE CONTRACTOR IN BUILDING A ROADWAY ACROSS A STRETCH OF SWAMPY LAND**

weights, the block weighing a total of 450 pounds. No fall rope carriers were used.

The engine, made by the J. S. Mundy Hoisting Engine Company, Newark, N. J., was a double-drum steam hoist with boiler, the forward or hoisting drum being smaller in diameter than the traversing drum. This engine, rated at 20 horse-power, is capable of exerting a maximum straight lift at the normal speed on a single line of 60,000 pounds.

This cableway was used to excavate material from the swampy section of Woodlawn Cemetery, so that a rock fill could be put down as a foundation for the new road. On account of the nature of the material no derricks could have been used. Material was handled by both a contractor's dumping bucket and a drag scraper bucket. The contractor, the superintendent of Woodlawn Cemetery, and the foreman on the work were very enthusiastic over the operation of the cableway, which paid for itself on this one job in 1921 and has been in use on a number of other jobs since then at a good profit.

### Bids for Furnishing Corrugated Metal Pipe for Hardin County, Kentucky

Bidders	Class A 18"	Class A 24"	Class B 18"	Class B 24"
Kentucky Culvert Manufacturing Co.....	\$1.49	\$2.40	\$1.16	\$1.82
Galion Iron Works & Manufacturing Co.....	....	....	1.27½	2.12½
Canton Culvert & Silo Co.....	1.33	2.10	1.15	1.82

Prices are f.o.b. Elizabethtown, Glendale, Upton, Lynnland, Nolin and Sonora, Ky.

Cost figures tabulated from *The Scraper*.



## How Do You Excavate Basements?

Pick and Shovel Men Are Inefficient—Progressive Contractors Now Use Mechanical Excavators

**T**HE present-day demand for speed and lower cost, together with the inefficiency of pick and shovel men—who are difficult to find and still more difficult to keep—has led to the development of various types of mechanical excavators and loaders. The T. L. Smith Company, Milwaukee, Wis., claims that two men with a Smith excavator and loader can do the work of a whole crew. This machine, which is a portable, gasoline-driven, dragline excavator, is designed specially for basement and general excavating and loading, drag excavating, loading of gravel and sand, stock-pile loading of gravel, sand, coal, etc., the stripping of sand, gravel, clay and rock, and the grading of alleys, streets, and general work.

The first of these machines was placed in service in 1912, and since that time the design has been constantly improved as a result of the experience gained in actual performance. In using this mechanical excavator, it is drawn into position in front of the proposed basement, bank or stock-pile of material. A heavy anchor chain, held in place by two deadmen, is set up beyond the material to be excavated. The haul-



**THE SCRAPER IS GUIDED BY A MAN ONLY WHEN IT IS BEING LOADED**

It is unnecessary for the man to follow the loaded scraper to the excavator

in and haul-back cables are then hooked through detachable sheave blocks to the anchor chain, and the machine is ready to begin work. When ploughing is necessary, the plow is attached in place of the scraper. The 35-horsepower gasoline engine furnishes power to pull a plow through very dry or frozen ground.

With the scraper in place, a man guides the scraper only while it is being filled. It is then drawn to the excavator, where it rides on to the lifting skip, to be elevated to the front of the machine, and there discharges into a wagon or truck or into a crusher, if desired, when gravel is being excavated.

In basement work, the excavator is set up along one side of the proposed basement, and that side is cut down to the proper depth. Because the scraper can be drawn in at any angle, a triangular piece extending from the back of the excavation to the front can be completely excavated and loaded from this first set-up. Approximately half of the material is removed with the machine in this first position. The machine is then moved to the opposite side of the plot, parallel to the first set-up, and the excavation completed.

No matter how large the excavation, this excavator and loader stays on the surface. The machine can be quickly moved when the work is completed, losing no time in having to take the machine out of the excavation. The truck or wagons, being at the surface level, can be loaded to capacity, and there is no extra expense for snatch teams. The Smith excavator has a particular advantage in that it can load sticky clay, as the lifting skip when it has raised the scraper to the discharging position



**EXCAVATOR BELONGING TO B. A. GIESE, GRADING AND EXCAVATING CONTRACTOR, MILWAUKEE, WIS., SHOWING MACHINE EMPTYING INTO DUMP-WAGON**





VIEW SHOWING EXCAVATOR ON WORK IN A NARROW ALLEY

is thrown slightly back by the recoil action of two large springs, one on either side of the machine. If that fails to dislodge all of the material in the scraper, it can then be bumped against the action of these springs several times until the remainder is dislodged. In excavating frozen earth, gravel containing large boulders and hard dry clay, these excavators have shown up to advantage.

In the small sand and gravel plant, the Smith excavator is a very satisfactory dragline. Gravel deposits are often small, thin and widely separated, but the machine can remove from 4,000 to 5,000 cubic yards at one set-up, it can be easily moved from pit to pit, and is always ready to load wagons or trucks direct without the necessity for building a trap. In many cases, bank-run gravel is loaded directly into the truck by the excavator without screening or crushing. With this method the excavator can be pivoted about one point and a circular excavation made.

Some contractors who pump their gravel or who require a dragline of greater capacity than the excavator, use it for stripping only. Other operators employ it as a backfiller, while still others use it for stock-pile loading. In stock-pile loading, the range of operation and speed are greater than that of the ordinary bucket conveyor loaders. It can often be set up in a position better suited for loading than is possible with loaders which must be located right next to the stock-pile. Ability to handle considerable material from one position also makes it unnecessary to change the location of the excavator frequently.

Because of the narrowness of many alleys, the Smith excavator and loader, with its straight-line pull, is a very practical machine for grading alleys. A scraper travel of 60 feet is generally used, and several set-ups are made in the length of a block. Trucks or wagons can be backed under the machine, loaded, and then readily driven

out of the alley.

In street grading the same method is used, with the machine spotted in the center of the street. It has also been used for cutting down hills. After the surface crust has been removed, it can usually load steadily all day with very little plowing. The amount of material which a man can handle with a hand shovel depends upon how many strokes he makes in a day. Much the same is true of any mechanical excavator and loader.

The maximum drag that can be made with a Smith machine is 100 feet, the machine being equipped with 125 feet of haul-in and 285 feet of haul-back cable. In most cases the haul-in distance used is not over 60 feet. A heaped scraper holds from 12 to 16 cubic feet of material, and the haul-in or high speed is 233 feet per minute. The haul-back speed averages 300 feet per minute. The low or digging speed, giving maximum power, is 122 feet per minute.

With the high scraper speeds the user may secure high or low output, depending on how continuously the scraper is kept moving in and out. The amount of plowing that is necessary, of course, affects the output. Many contractors have increased their earnings by using a team to do nothing but plow, thus allowing the machine to be concentrated on excavating and loading.

#### "More Religion in a Smile"

"THERE'S more religion in a smile to the living than a eulogy to the dead."

So reads some publicity gotten out by the Ohio River Sand Company, Pittsburgh, and Mr. McGaw has said much in little.

Also, there's more religion (a word of many meanings) in cooperation than in cut-throat competition.

—The National Sand and Gravel Bulletin.



EXCAVATOR BEING USED IN A SMALL GRAVEL PLANT, DRAGGING GRAVEL FROM THE PIT TO THE CRUSHING PLANT



# NOTE THESE BULLETINS

The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up to date on the subject of machinery and equipment.

## NON-TILTING CONCRETE MIXERS

Catalog No. 405-3, issued by the T. L. Smith Co., Milwaukee, Wis., is devoted chiefly to the description and illustration of non-tilting types of Smith concrete mixers and contains many illustrations and much material of interest to contractors.

## STANDARD ASPHALT MACHINERY

Iroquois tandem rollers, used the world over, are among the products of the Iroquois Works of the Barber Asphalt Co., Land Title Bldg., Philadelphia, Pa., which include all kinds of machinery for the making and laying of asphalt roads.

## SEMI-PNEUMATIC TRUCK TIRES

The remarkable stories of semi-pneumatic truck tires and the savings they make in tire costs and general motor truck up-keep, are told in the literature of the B. F. Goodrich Rubber Co., Akron, Ohio.

## CURING NEW CONCRETE

The latest literature of the Dow Chemical Co., Midland, Mich., describes the use of Dowlakes, an especially prepared calcium chloride which comes in 100-pound moisture-proof sacks and which enables contractors to open roads weeks sooner, reduces the freezing point and hastens the set in cold weather, and eliminates ponding.

## LANTERNS FOR CONTRACTORS' USE

Kerosene lanterns and lamps for all kinds of contracting work are described in detail in Circular No. 100 issued by Handlan, Buck Mfg. Co., St. Louis, Mo.

## VALUABLE CONCRETE DATA

Contractors and engineers may secure a free booklet containing valuable data on the essentials of good concrete, under the title "Concrete Data for Engineers," by writing to the Portland Cement Assoc., 111 W. Washington St., Chicago, Ill.

## A PATROL GRADER

A patrol grader in which the chattering of the ordinary maintenance grader is done away with, thus making it easier for the operator, is described in Bulletin 121, issued by the Stockland Road Machinery Co., 3326 27th St., East, Minneapolis, Minn.

## A NEW MODEL TRENCH EXCAVATOR

The new Parsons Model 30 trench excavator, having a 12-foot wheel-base, and a digging range from 18 to 30 inches in width and from 8 to 12 feet in depth, is described in detail in a new folder which may be secured from the Parsons Co., Newton, Iowa.

## COMPLETE BOOK ON UP-KEEP PAINTING

The Paint and Varnish Division, E. I. DuPont de Nemours & Co., Inc., 35th Street and Greys Ferry Road, Philadelphia, Pa., has just issued a very valuable book which describes in a simple, practical fashion modern painting practice for all types of exterior and interior surfaces. This book may be secured free by contractors, engineers and architects, by writing to the Paint and Varnish Division on their own letterheads. Second copies may be secured at \$2 each.

## A NEW PAVES CATALOG

The Koehring Co., Milwaukee, Wis., manufacturers of concrete mixers, pavers, crane excavators, draglines and shovels, have just issued a new catalog, No. 24, describing their heavy-duty pavers. This catalog is complete, giving all of the information desired regarding the construction, operation and performance of the complete line of Koehring heavy-duty pavers.

## A PORTABLE SAND AND GRAVEL DRYER

Bulletin No. A-4, issued by Littleford Bros., 500 E. Pearl St., Cincinnati, Ohio, describes in detail the Littleford No. 74 gravel heater and dryer, made in two sizes, with capacities of 2 and 4 tons per hour.

## MIXER SUPERIORITY

The new Jaeger catalog tells just how Jaeger concrete mixers are made and why they are better for contractors in the long run. This catalog may be secured from the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio.

## 2-, 5- and 10-TON TRACTORS

Holt 2-, 5- and 10-ton Caterpillar tractors are claimed to meet every power need on the contracting and road-making job. The latest literature of the Holt Manufacturing Co., Peoria, Ill., tells the story of Caterpillar service in detail.

## SURE PROFITS IN STONE SPREADING

The Burch stone spreader, which pays for itself in the first mile on which it is used and spreads gravel, slag or stone easily to the required depth, is described in detail in literature which may be secured from Dept. B-7, the Burch Plow Works Co., Crestline, Ohio.

## RIGID CURB BARS

The literature of the Truscon Steel Co., Youngstown, Ohio, describes in detail Truscon curb bars, which have a positive anchorage, are rigid and are easy to install.

## TRACTORS FOR SUMMER WORK

Tractors have a distinct appeal for summer work, as their output and hauling ability is in no way diminished by the heat. The value of the Best Tracklayer tractors for all-year-round work is told in detail in the literature of the C. L. Best Tractor Co., San Leandro, Calif.

## METAL LATH CONSTRUCTION

A complete set of approved specifications of metal lath construction, covering the quality of materials and methods of application of all types of metal lath expanded from sheets, may be secured without charge from the Associated Metal Lath Mfrs., 123 W. Madison St., Chicago, Ill.

## HEATING WITH LOW-PRICED COAL

Catalog No. 51, issued by the Molby Boiler Co., 41 E. 42nd St., New York City, describes the new Molby boiler which uses No. 1 buckwheat coal and has an automatic feed that needs filling only once every twelve hours.

## HAULING BRICK WITHOUT BREAKAGE

The Garford Motor Truck Co., Lima, Ohio, will be pleased to furnish complete information regarding its 1 to 7½-ton trucks equipped with demountable brick bodies, which handle brick rapidly and without breakage.

## EXPANSION JOINTS FOR CONCRETE WORK

The Philip Carey Co., 9 Wayne Ave., Lockland, Cincinnati, Ohio, will be pleased to send data, a sample and a list of 17 cities where it maintains warehouse stocks of Elastite expansion joint, a permanent and effective easement to all stresses of expansion and shocks of truck traffic.

## CHOOSING A STEAM SHOVEL

In a new folder which may be secured from the Advertising Department of the Thew Shovel Co., Lorain, Ohio, this company gives interesting evidence of experience in design and construction and the performance of steam shovels on all kinds of contracting work, under the heading, "You Be the Judge."



**SNAP-SHOTS OF CONTRACTORS' MACHINERY**  
The Austin Machinery Corp., 3500 Dorr St., Toledo, Ohio, has issued a well-planned 24-page catalog containing snap-shots of its full line of contracting machinery, with helpful information and data on operation.

#### PERMANENT WHITE PAINT

The Detroit Graphite Co., Detroit, Mich., has published an interesting book, "Lighting Industrial Interiors," which contractors should look into when bidding on industrial jobs involving the need of paint which will remain permanently white.

#### WINCH EQUIPMENT ON MOTOR TRUCKS

The Four Wheel Drive Auto Co., Clintonville, Wis., has just issued an 8-page booklet describing in detail FWD winch equipment, which has many advantages for contractors' trucks.

#### DOUBLY REINFORCED CONCRETE CARTS

The Sterling catalog of wheelbarrows and carts describes in detail the No. 6 concrete cart, which is doubly reinforced, has 42-inch wheels equipped with grease cups and cold-rolled steel axles, made by the Sterling Wheelbarrow Co., Milwaukee, Wis.

#### CONCRETE TUNNEL FORMS

The literature of the Ransome Concrete Machinery Co., 1772 Second St., Dunellen, N. J., in addition to describing Ransome dependable concrete mixers, gives complete information regarding Ransome tunnel forms and Ransome pneumatic combination and put the responsibility for all concrete equipment in one place.

#### COMPRESSED AIR OUTFITS

The Novo Engine Co., Lansing, Mich., has issued a special bulletin describing the Novo EFH air compressor outfit, which is warranted to give a continuous regular supply of air from 45 to 160 cubic feet per minute, depending on the size used.

#### A-1 DITCHES AT LESS COST

A new catalog describing Adams adjustable leaning wheel graders has been issued by J. D. Adams & Co., Indianapolis, Ind., showing in detail how Adams graders with back-sloper attachments build flat-bottom, back-sloped ditches at less cost than other methods.

#### PNEUMATIC BUSHING TOOLS

The Thos. H. Dallett Co., Philadelphia, Pa., has issued a series of bulletins specially prepared for contractors, describing its pneumatically operated tools for surfacing and drilling all concrete surfaces.

#### PUMPS THAT INSURE PAVING PROFITS

Bulletin 106, describing Triplex and Quadruplex road builders' pumping plants, made by the Barnes Mfg. Co., Mansfield, Ohio, contains some interesting information regarding these pumping units for concrete road builders.

#### WHY PUMP BY HAND?

The shortage of labor is fast becoming acute and many jobs would be tied up but for the use of machines. Bulletin "IC" issued by the Domestic Engine & Pump Co., Shippensburg, Pa., describes Domestic power trench pumps, which keep the job going.

#### OUTFITS FOR BUILDING CONTRACTORS

The C. H. & E. Manufacturing Co., Milwaukee, Wis., has recently issued a new folder which illustrates its complete line of machinery for building contractors, including saw rigs, pumps, hoists, elevators, mortar mixers and engines.

#### BETTER BITUMINOUS CONCRETE ROADS

The reprint of a paper presented at the Conference of Engineers of New York State Highway Departments, which may be secured free from Warren Bros. Co., 9 Cambridge St., Boston, Mass., describes the distinct advantages secured by sealing a bituminous concrete pavement with a hot sand mixture.

#### A NEW PORTABLE ACETYLENE GENERATOR

The Alexander Milburn Co., 1416-1428 W. Baltimore St., Baltimore, Md., has recently brought out a new portable welding generator which is small and self-contained and obviates the use of cylinder gas with its high cost and vexatious delays. This "American Type" generator is described in detail in a 24-page booklet, which may be secured free on request by contractors.

#### TOOLS FOR BETTER CEMENT WORK

The Abram Cement Tool Co., 3815 Grand River Ave., Detroit, Mich., makes long-handled, double action cement tools for concrete roads, walks and other work, all of which are described in Booklet No. 34, which may be secured free by contractors on request.

#### TRUSTWORTHY POWER FOR HARD WORK

Moderate-speed, heavy-duty engines for operation by kerosene or gasoline for all kinds of contracting machinery are described in detail in the catalog of the Climax Engineering Co., 1 West 18th St., Clinton, Iowa.

#### ROAD DRAGS—GRADERS—PLANERS

The complete line of road machines, including Monroe superior two-way drags, road graders, giant drags, and "Jumbo" road planers, is described in detail in folders replete with worth-while information, which may be secured from N. S. Monroe & Sons, Arthur, Ill.

#### SEWER BUILDERS' EQUIPMENT

In Bulletin No. 523, the W. H. Anderson Tool & Supply Co., DuBois & Franklin Sts., Detroit, Mich., lists and describes its complete line of sewer and trench braces, concrete or wall chisels, electric clay tunneling winches, ground augers, manhole steps, clay forms, salamanders, sewer picks, tunneling grubs and other equipment.

#### HIGH-SPEED ROAD MACHINERY

In its 64-page latest complete catalog of Russell road equipment, the Russell Grader Mfg. Co., Minneapolis, Minn., describes in detail its well-established line of equipment for nearly every road job.

#### PORTABLE AIR COMPRESSORS

The Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill., has issued an interesting booklet, No. 77-D, describing the services of Sullivan portable air compressors on road and other work necessitating the use of a dependable, portable air compressor unit.

#### PORTABLE GYRATORY CRUSHERS

Bulletin No. 30, issued by the Austin-Western Road Machinery Co., 400 N. Michigan Blvd., Chicago, Ill., describes in detail Austin portable gyratory crushing and screening plants, which have many merits that should be looked into by contractors considering purchases in this line.

#### TRACTORS IN ACTION

The J. T. Tractor Co., 17900 St. Clair Ave., Cleveland, O., has issued a folder describing in detail its Model 22 J. T. tractor, together with a number of very interesting prints showing it in action on various kinds of jobs.

#### WIRE FORM TIGHTENERS AND BAR COUPLINGS

In a very helpful folder, "Little Things That Are Big Helps in Concrete Construction," the Marion Malleable Iron Works, Marion, Ind., describes in detail the use of wire form tighteners for concrete construction, and Marion bar couplings which make possible the butt-jointing of steel bar reinforcing.

#### A TRENCH PUMP WITH 50-FOOT TOTAL LIFT

Bulletin 101 issued by the Ralph B. Carter Co., 132 Chambers St., New York City, describes in detail the Carter "Hundinger" diaphragm pump which is able to draw water 20 feet vertically and in addition force it 30 feet vertically, making a total of 50 feet per unit.

#### BETTERING YOUR REPUTATION

The Asphalt Sales Dept., The Texas Co., 17 Battery Pl., New York City, is always ready to help contractors in asphalt road jobs with constructive advice and service. The literature of this company describes in detail the best methods for building asphaltic concrete and penetration roads. This literature may be secured free on request.

#### MORE THAN 600 IN USE

The Pawling & Harnischfeger Co., 3819 National Ave., Milwaukee, Wis., makes the statement that 600 P & H excavators are in use and that converts to this gasoline-driven machine are increasing every day. Ask the Excavating Machinery Division of this Company for a copy of Bulletin 58-Y, which tells the reason why this excavator is in such general use.

#### ROAD-BUILDING CONTRACTORS' MACHINERY

The Oberlin Machinery Co., Oberlin, Ohio, will be pleased to send its complete set of folders describing road-building contractors' machinery, including road graders, drags, subgraders and levelers, capable of handling all road work.

#### NO SHUT-DOWNS WITH THIS ENGINE

The Engine Div., The Hercules Corp., Evansville, Ind., claims that there is never a shut-down with a Hercules engine on the job. The reason for this is told in the latest literature of this company, which describes the use of these engines in hoisting, concrete mixing, air compressors, dimension sawing and fifty other contractors' service jobs.

#### A NEW COMMERCIAL TRUCK

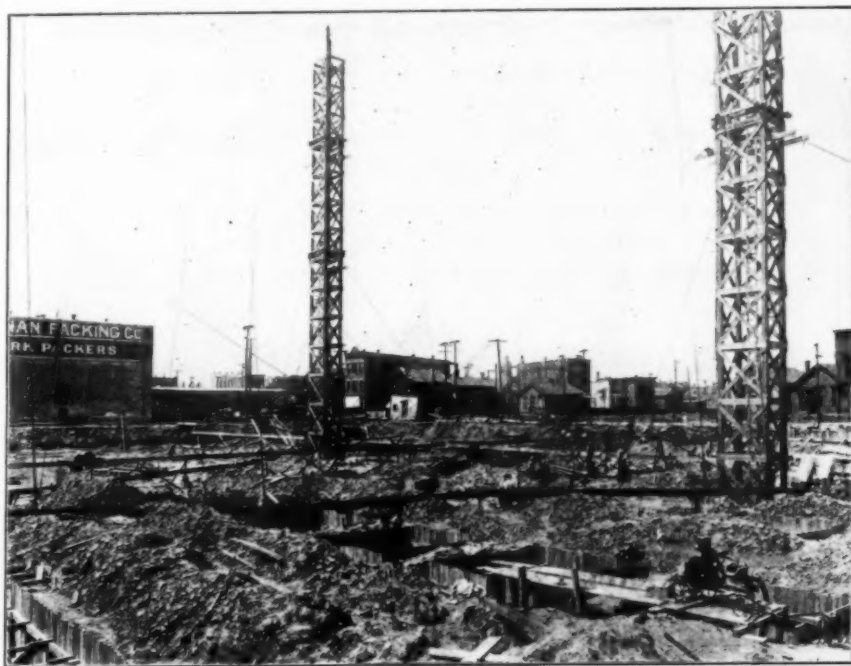
Three and one-half and five-ton model commercial trucks are now being manufactured by the American La-France Fire Engine Co., at its commercial truck factory, Bloomfield, N. J. These trucks, backed by the guarantee of this well-known fire engine company, are described in detail in two 24-page catalogs which may be secured free by interested contractors.



## A Road Grading and a Foundation Job



A NEW MODEL 21 MARION GAS-ELECTRIC POWER SHOVEL GRADING FOR NEW ROAD SURFACING



A NOVO-GOULD PUMP UNWATERING PIER FOUNDATIONS ON LARGE BUILDING JOB



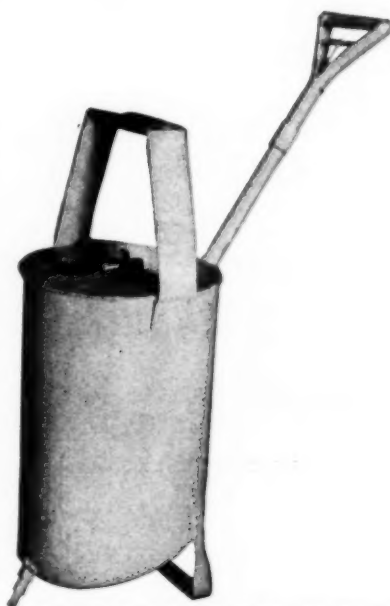
## Filling Uneven Joints or Cracks

New Portable Tank with Easily Operated Valve Saves Time and Material

THE new "Tarco" joint filler, made by the Tarrant Manufacturing Company, Saratoga Springs, N. Y., is built for straight, uneven or crooked joints as desired, with hot asphalt, tar or other heated material, by the use of a nozzle located on the bottom of the pot, graduated to three sizes. At the lowest point or bottom of the pot is a ground joint valve which controls the flow. This valve is so close to the end of the nozzle that the drip or waste is negligible.

The tube composing the handle also contains the rod which seats the ground joint valve at the bottom or outlet. The spring for operating this valve is built into the handle outside of the pot proper, therefore it is not affected by the heat in any way. All parts of this container are replaceable, and the entire pot is welded and can be burned out at any time desired.

The pot is furnished with a strainer if desired, so that all material going into the pot must pass through the strainer. The bail is thoroughly fastened to the body of the pot and arranged with a boss for easy handling. This pot is novel and has been designed to meet a long-felt demand for an article of this character for the use of municipalities and contractors and tile workers to take care of checks in concrete and asphalt roads, the filling of brick paving joints, expansion joints or tile work, and to do any filling that may be necessary where heated material is to be used.



A POURING POT THAT MINIMIZES LEAKS AND DRIPPING

### Summary of Recent Awards for Bituminous Surface Treatment in Kentucky Counties

Items	1	2	3	4	5	6	7
Cleaning .....	.01	.01	.00½	.01	.01	.01	.01
Light tar .....	.16	.16	.16	.15½	.15	.12½	.12½
Light oil .....	.13½	.13½	.13½	.12½	.12	.15½	.15½
Medium tar .....	.15	.16	.15½	.15½	.15½	.15½	.17
Heavy oil .....	.12½	.13½	.13½	.12½	.13	.13½	.14
Stone chips .....	4.25	4.75	5.10	4.75	5.50	.....	4.50
Pea gravel .....	4.50	5.00	5.50	4.50	5.50	.....	5.00
<b>Totals</b>							
Tar and chips .....	\$14,492	\$8,611	\$29,335	\$22,676	\$36,510	\$24,609	\$12,219
Oil and chips .....	13,400	7,934	27,385	29,514	34,155	22,742	11,064
Tar and gravel .....	14,843	8,789	30,489	22,216	36,519	24,828	12,713
Oil and gravel .....	13,750	6,111	28,539	20,055	34,154	22,961	11,558

1. Awarded to R. B. Tyler Co., Louisville, Ky., for Boyle, Fayette, Mercer, Woodford and Montgomery Counties.
2. Awarded to Southern Oil & Tar Co., Louisville, Ky., for Nelson and Marion Counties.
3. Awarded to Southern Oil & Tar Co., Louisville, Ky., for Pulaski, Rockcastle, Lincoln and Bell Counties.
4. Awarded to R. B. Tyler Co., Louisville, Ky., for Shelby, Scott, Henry and Oldham Counties.
5. Awarded to The Eaton Oil Works, Covington, Ky., for Bracken, Pendleton and Bourbon Counties.
6. Awarded to Southern Oil & Tar Co., Louisville, Ky., for Garrard, Madison, Jessamine, and Estill Counties.
7. Awarded to R. B. Tyler Co., Louisville, Ky., for Hart and Warren Counties.

Cost figures tabulated from *The Scraper*.

We need a nation full of tender consciences and calloused hands. The thing seems to be reversed at present.—*Richmond News-Leader*.



## Stage Money Beats Strike

By William J. McNulty

St. John, N. B.

**T**HE Waller Construction Company, a Canadian concern, is composed of men who wield effective weapons in combating the professional labor disturber. This company is building fifteen houses in eastern Canada. The work went along without interruption and without disturbance until recently, when a series of demands culminated with the strike of two-thirds of the skilled and unskilled labor. The Waller Construction Company had been maintaining an open shop despite the ultimatums from executives of labor unions.

When the men struck, the Waller Construction Company did not secure men to replace the strikers, although this could have been achieved with much difficulty and delay. The chief reason for not supplanting the strikers with new men was that the strikers had been familiar with the work required of each, and new men would require breaking in on every duty. This would mean a waste of time and money, and production that would be below par. It is an unwritten law of the company that all contracts must be handled not only expeditiously and economically, but with an eye to perfection in quality.

When a delegation of the strikers appeared before the manager, E. J. Kennedy, he greeted them courteously and explained to them that the entire trouble was created by the professional labor disturber. A man had arrived in eastern Canada surreptitiously a few weeks previously and had been organizing workers into distinct groups affiliated with the Workers Party of America. Mr. Kennedy invited the men to return and discuss the trouble from every angle with him two days later.

In the meanwhile, he detailed three of his office staff to make a personal call at the home of each of the workers when the head of the family was out. If the man was married, the company employee sought to talk with his wife, pointing out to her the loss that would accrue from continued idleness during the building season, alluding directly to the lean months coming during the winter. Great progress was made with the wives, in most instances. Each wife was notified that no penalty would be

placed on her husband, even if he were actively connected with the walkout, providing he returned to work under the old conditions within two days. It was found that the unmarried men were harder to deal with. Having no responsibility, they heeded the call of the disturber to a greater extent than the married men, who had in some instances walked out just because of fear of the majority if they had remained at work.

How to have the single men return to work, without acceding to the demands for higher wages, and a closed shop, and minor demands, was the problem. The motto of this company is to manage its own business, hence it would be a deviation from fixed policy to accede to the demands of the men. However, Mr. Kennedy, in consultation with his staff, found a way out of the difficulty.

The delegation from the strikers came at the appointed time to call on Mr. Kennedy in his office. It was after dark. Before they reached the building office, they were met by an office employee of the company, and instructed to follow him quietly to the rear of the building office. Wonderingly, they obeyed the suggestion, each man remaining quiet in his movements. The window blind of one of the windows in the room occupied by Mr. Kennedy was down to within about an inch of the casing. The office employee looked into the room through this aperture, and then motioned the members of the delegation to look in upon a very animated scene that was being enacted in the room. They saw Mr. Kennedy handing a roll of bills to the visiting organizer. When the organizer made his exit from the office the men of the delegation confronted him and he retreated, but not before being punished, by hands and feet and missiles. The following day, every man returned to work, and each man readily signed a pledge that for the building season he would remain with the company at the same wages and under the same conditions. The following day the organizer also made a disagreeable discovery. He found the roll contained fifteen one dollar bills, the balance in the middle of the roll being stage money.

## Miller Reappointed on the National Board for Jurisdictional Awards

**R**UDOLPH E. MILLER, Former Superintendent of Buildings in Manhattan, has been reappointed representative of the Federated American Engineering Societies on the National Board for Jurisdictional Awards to succeed himself when his present term expires in August. Mr. Miller's service on this board has been characterized as "earnest and constructive."

The waste in industry due to jurisdictional strikes, according to Mr. Miller, has been estimated at millions of dollars. "No definite figures have ever been set down, and it will be difficult to get such definite figures, but there is no doubt that the losses to the building industry and the general public have been enormous. E. J. Russell, Vice-President of the American Institute of Architects, estimates that



the cost to the owner of building operations previous to the establishment of the Jurisdictional Board was increased from 7 to 8 per cent unnecessarily because of jurisdictional strikes. Since the establishment of the Board, it is his estimate that the extra cost on the same account has been reduced to about one-half of one per cent of the total cost. While it is practically impossible to get definite figures in this matter, this estimate of Mr. Russell's is re-

garded as a fair one."

Cooperation of contractors, architects and engineers has been obtained, and, as now organized, this arbitration body is made up of three representatives of the labor unions, three representatives of contractors and employers of building trade workers, a representative from the American Institute of Architects, and one from the Federated American Engineering Societies.

## Water-Supply for Road Jobs and Pump for Dewatering Trench

Goshen, Ind., Contractors Make 400-Mile Trip for Pumping Unit

**T**HE necessity for protecting the water-supply for road jobs was very clearly demonstrated in the case of Reith & Riley, Goshen, Ind., when recently, on their Kankakee, Ill., job, the city water-supply failed them and they had to stop work. A Barnes "Quad 44" pumping-plant was immediately ordered from the Dolan-Tucker-Smith Equipment & Supply Company, Chicago representatives of the Barnes Manufacturing Company, of Mansfield, Ohio. Fearing that freight delivery might be too slow, Reith & Reilly sent their Reo speed wagon to the factory at Mansfield, Ohio, for it.

The 5,000-pound pump was a sizable load for the truck, but it left Mansfield Tuesday afternoon, May 15, was driven all night through a blinding snowstorm, and reached Goshen Wednesday afternoon. After making a change to oversize tires at Goshen, the trip was resumed, and the pump was delivered at Kankakee Thursday afternoon and put into service Friday, supplying their 21-E paver with sufficient water to keep it going.

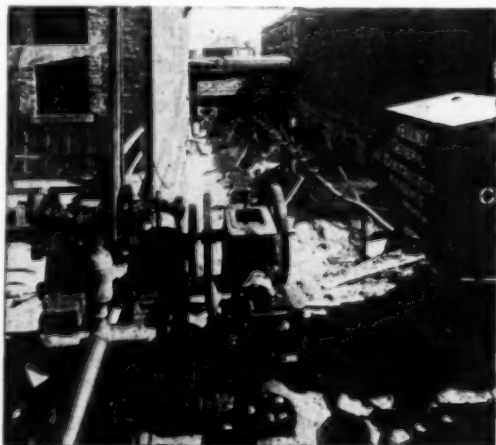
### Plunger Trench Pump on Well Point Job

A successful contractor has to be a good deal of an inventor; that is, he must adapt his methods to meet the conditions on his job. Because seepage water in an excavation will stop or delay the work, it is necessary to have some kind of pump to drain it as fast as it collects. H. B. Olney of Indiana Harbor, Ind., recently decided to drain the water out before it collected in the excavation, and, furthermore, did away with expensive sheet piling and timbering.

The Olney contract consisted of putting in a building foundation below and between two brick structures. The soil was sandy and was easily handled until he struck water. The banks then began to cave and slough, endangering the foundations of the adjacent buildings. The sand stood almost vertical when damp and com-

pact, but its angle of repose was very slight when saturated. Thirty well points were driven down just inside the limits of the excavation and connected by suction hose to a 4-in. leader line. A Barnes double 4-in. plunger trench pump was used to exhaust this header line and pull the water through the entire system. The pump has a capacity of 12,000 gallons per hour, which was more than enough to handle the job.

The pump was started as soon as water was encountered, and worked continuously day and night until the excavation was completed and the concrete in place. New foundations were placed under the walls of the adjacent buildings, and the whole job was completed without the use of sheet piling. The walls under the existing buildings were placed in sections, the sand being undercut at intervals of a few feet to permit the placing of concrete without endangering the structure.



KEEPING EXCAVATION DRY FOR BUILDING FOUNDATION, WITH WELL POINTS AND PLUNGER TRENCH PUMP





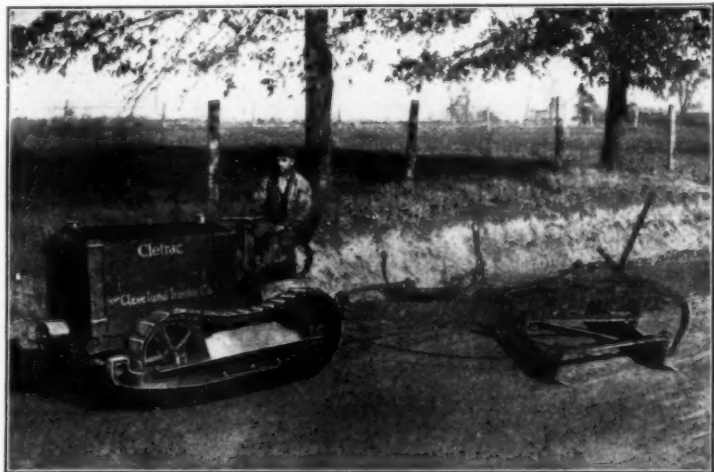
UPROOTING TREES AND CLEARING LAND BY TRACTOR

## The Services of Medium-Weight Tractors

**C**ONTRACTORS find that medium-weight tractors are particularly helpful in road building, as they do the work of 6 to 8 horses or mules on grading and dragging machinery, doing a better job and more work in a day with a great saving over the cost of animal power. They are used to clear the routes of new roads, plow up the rocks, pull out roots or scarify an old road-bed, remove

the dirt down to grade, and bring in heavy loads of road-building material.

This type of tractor is frequently used as a snatch team. It hooks onto loads that two teams could not pull and takes them out of excavations with ease. It saves the time and expense of unloading trucks at the end of good roads, as it takes the heavy loads right to the point where the material is needed.



HANDLING ROAD-DRAKS AND OTHER MAINTENANCE MACHINERY



## Self-Dumping Steel Body for One-Ton Trucks

Complete Unit Can Be Bolted to Truck Frame Quickly and Firmly

A NEW self-dumping steel body unit for one-ton trucks is now being manufactured by the Wood Hydraulic Hoist and Body Company, Detroit, Mich. The body, with its mounting frame, hinges and locking device, is a complete unit ready for placing on the truck frame. There are no holes to drill nor any parts which are attached separately. The mounting of the unit on a Ford truck is very simply accomplished by placing the body in the required position and bolting it securely in place with the bolts furnished with the unit. The hinges on which the bodies tilt are two large pins or fulcrums which displace the center of the loaded body towards the rear while dumping, assuring quick action and obtaining a high dumping angle to discharge the body's contents cleanly. The body is returned to the down and locked position by a handle attached to the front of the body. Only a slight effort is required, as the body when empty is in a balanced condition. The release handle is arranged for convenient operation by the driver and positively locks the body against accidental dumping.



NEW ONE-TON DUMP BODY SHOWN IN DUMPING POSITION

This new body has many advantages for contractors hauling concrete batches from a central proportioning plant

## Digest of Some Recent Successful Bids on Kentucky Road Jobs

Items	1	2	3	4	5	6
Clear and grub.....	\$150.00	\$150.00	\$100.00	\$50.00	\$100.00	\$150.00
Trees and stumps .....	6.00	6.00	3.00	3.00	5.00	7.00
Earth excavation .....	.40	.40	.40	.38	.52	.40
Rock excavation .....	.....	.....	1.00	.....	.....	1.25
Borrow excavation .....	.40	.40	.40	.38	.50	.50
Structure excavation .....	1.00	1.00	1.00	.50	1.50	.50
Foundation excavation	.....	.....	.....	.....	.....	.....
Dry earth .....	.....	1.00	1.00	2.00	1.20	1.00
Wet earth .....	.....	3.00	2.00	2.00	2.00	3.00
Dry rock .....	.....	3.00	1.00	4.00	2.00	1.50
Wet rock .....	.....	3.00	2.00	4.00	2.50	4.00
Overhaul .....	.03	.03	.03	.03	.04	.03
Concrete A.....	21.00	21.00	20.00	25.00	20.00	21.00
Concrete B.....	21.00	21.00	20.00	.....	19.50	21.00
Concrete D.....	.....	60.00	40.00	75.00	45.00	60.00
Reinforcement .....	.07	.07	.06	.07	.06	.07
18" standard vit. pipe.....	2.00	2.00	2.00	2.50	2.00	3.00
24" standard vit. pipe.....	3.00	3.00	2.00	3.00	3.00	4.00
Encasing concrete .....	21.00	21.00	20.00	21.00	15.00	21.00
18" concrete pipe.....	2.90	2.90	3.00	3.00	3.00	3.50
24" concrete pipe .....	4.25	4.25	4.00	4.00	4.00	4.75
Timber piling .....	.....	1.50	.....	.....	.....	.....
Totals						
Vitrified pipe .....	\$22,331	\$31,477	\$21,593	\$79,461	.....	\$203,029
Concrete pipe .....	21,803	31,126	21,029	77,797	.....	198,125

1. Muhlenburgh County, 4.327 miles, Central City-Calhoun Road, J. C. Ellis, Owensboro, Ky.

2. Webster County, 4.915 miles, Dixon-Madisonville Road, J. C. Ellis, Owensboro, Ky.

3. Webster County, 3.879 miles, Dixon-Henderson Road, W. W. Carter, Clay, Ky.

4. Harlan County, 5.905 miles, Harlan-Pineville Road, Eastern Construction Co., Harlan, Ky.

5. Kenton County, 10.282 miles, Covington-Falmouth Road, Hannon, Hughes Const. Co., Cincinnati, Ohio.

6. Morgan County, 13.925 miles, West Liberty-Frenchburg Road, Ellis & Smeathers, Owensboro, Ky.

Cost figures tabulated from *The Scraper*.





## Power!

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volume of work done, year after year. Investigate the latest "Caterpillar" from the standpoint of its power and capacity. You will agree it has no real competitor.

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## Dirt-Moving---B. C. and To-day

Contrasting Primitive and Modern Methods—Which Is Better?

**T**HE first construction job, away back in pre-Neolithic days, consisted of moving some dirt from a place where it was not wanted to some other spot where it would be out of the way. The cave man, finding his boudoir uncomfortably crowded by the latest addition to his growing family, persuaded his affectionate helpmate to heave a couple of tons of earth and rock down into the valley.

Later on, the kings of Babylon moved tons of fertile earth to build the famous hanging gardens where their myriad wives could enjoy an outing without looking like a female seminary out for a walk. Ancient Egypt, and still more ancient India, moved dirt in digging the irrigation ditches on which the life of the countries depended.

No one bothered with cost accounts in those days. Labor was free, as far as the bosses were concerned; wages were undreamed of; and a shortage of immigration never troubled the great builders of old. When they wanted immigrants, they started out with an army and captured them. No little 3 per cent limit, either. They took the whole tribe. Neither did they insist on a literacy test.

Things are different to-day. But dirt must still be moved, and there seem to be nearly as many different ways of doing it as there are contractors, each one striving for a method which will be the most economical.

An example: Two buildings are being erected in Salt Lake City, Utah, and two contractors, both of them experienced builders, are moving the dirt at low prices, but by entirely different methods.

The P. J. Walker Construction Company is digging the basement for a large new building to be occupied by two banks which have merged. Mr. Walker is using for his excavation a steam shovel supplemented by the most up-to-date equipment. The shovel, standing on tracks at

the street level, picks up the combined gravel, bricks, rocks, and general debris, and dumps it into a hopper, which will hold about 20 cubic yards. Trucks are backed in from the street and loaded, and the material is hauled away to the dump.

It is a good, cheap, efficient way of handling this job. No waiting for trucks; therefore the shovel can be worked every minute. No interference with other traffic, for the entire job is enclosed with a high board fence, and an extra sidewalk is built just outside. The wide streets of Salt Lake City make this possible without congesting traffic.

The other job is much better from the standpoint of the general contractor. The Jacobsen Construction Company is building, for the Bamberger Interurban Railway, a new station, a concrete and brick structure which will cost about \$200,000. This contractor, too, is handling his dirt cheaply and efficiently, but there is no modern equipment necessary here. He uses a primitive implement to good advantage. It is nothing but a wooden shovel, about 42 inches wide and 36 inches long, with a steel cutting edge. It holds very little dirt, and is nearly as hard on the man who loads it as it is on the horses. But it sure can move dirt for short distances, and do it cheaply.

Mr. Jacobsen is hauling his dirt up-hill onto a platform and dumping it through a glory-hole onto an endless chain of buckets, which conveys the material to a waiting freight car. From then on, the stuff belongs to the railroad company. What they do with it is their affair. The contractor has no further worries.

Who wins in this competition for economy? No one knows. Were they to change jobs, each man might adopt the other fellow's system. Or he might handle his excavation in an entirely different way.

—*The American Contractor.*

## Waste Eliminated in Roofing Industry

**T**HE Prepared Roofing Association, in accordance with the recommendation of Herbert Hoover, Secretary of Commerce, that it cut down the number of varieties of its product, has decided that 36 varieties of rolled roofing now being manufactured mainly from waste material could be reduced to 7 and all needs would be met. Economies resulting from this policy promise ultimately to reduce the cost to every man who puts a roof on his house.

About 80 per cent of the rolled roofing manufacturers in the United States were represented at the meeting, and seven out of ten of the roofs made are of the kind of roofing they supply. In his address before the Association, Mr. Hoover said that one of the chief

faults of the American manufacturing industry is that there are too many styles of products being put out, and standardization along this line will bring a great saving for everybody. "Statistical anticipation" is what the Department of Commerce desires in the preparation of trade statistics, in order that business men can better know what future trade conditions they will have to face. In harmony with this, the roofing manufacturers recommended that information concerning orders received, shipments made, and stock on hand on certain dates should be prepared and given freely both to the manufacturers and to the retailers, and that publicity regarding their industry should be welcomed instead of shunned as heretofore.



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## Successful Finish of Unique Transportation Feat

Last Public Building to Be Moved in Jennings, Michigan, Is a Church

By C. R. Smith

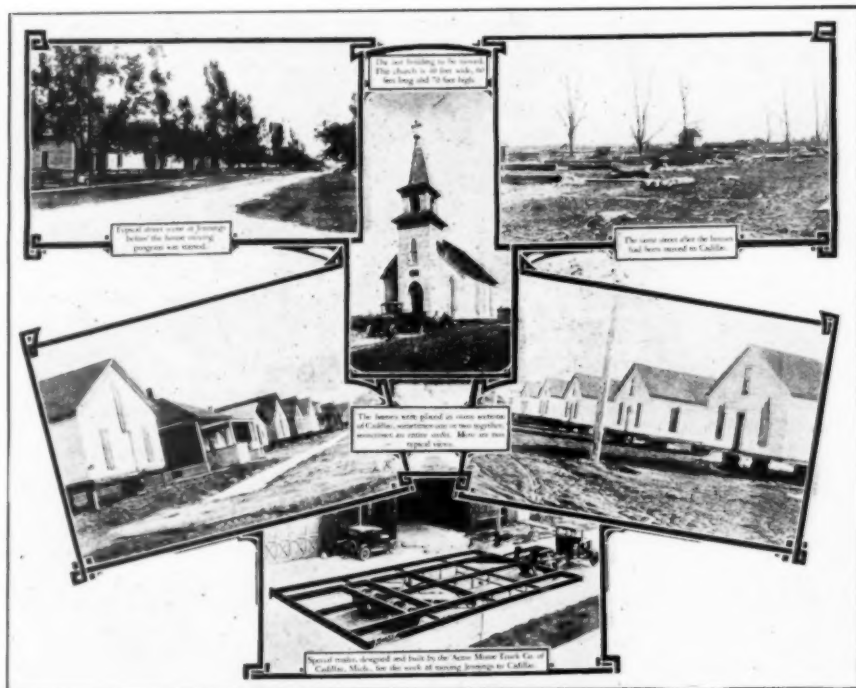
Secretary, Chamber of Commerce, Cadillac, Mich.

THE moving of the village of Jennings, Mich., by motor truck and especially designed trailer has now been completed, and "finis" has been written to the event, the greatest transportation feat in the history of the automotive industry thus far recorded.

Jennings was a village of about 1,200 inhabitants, the only industrial enterprise of any sort being the sawmill, flooring and chemical plants, of the Mitchell Brothers Company, giving employment to all the able-bodied men of the village, several hundred in number. Logs which fed the mill and which in turn supplied the chemical and flooring plants with raw material could no longer be secured in the vicinity, because all of the standing timber had been cut. The mills are being moved to Cadillac, between 11 and 12 miles southwest, where larger and more modern factories are being built, which when completed will give employment to many more men than the former mills at Jennings.

In common with most American cities, Cadillac has been handicapped for several years with a shortage of houses, and as it is the desire of the lumber company to retain as many of its former employees as possible, it was imperative that the former residents of Jennings should have some place in Cadillac to live in when they came to this city with the mills. In Jennings there were upwards of about a hundred very well-built and desirable houses, the property of the company. The problem was to move them to Cadillac intact without tearing down or damaging the structures.

A thorough investigation of different methods of moving the village was made, and at the conclusion of this investigation a unique plan of using a motor truck and an especially designed and built trailer was adopted. Walter A. Kysor, President of the Acme Motor Truck Company, who has had many years of experience in structural steel work and who was the designer of the first large theater balcony hav-





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ing no supporting columns built in the United States, worked out the trailer design accurately and carefully. The houses were raised by jacks, the specially designed trailer was backed underneath, then the buildings were lowered until the weight rested entirely on the body of the trailer, and after that it was merely a matter of transportation.

After various building movers had been consulted in connection with the plan of moving the houses intact, all but one of them said that it was not a practical method and could not be

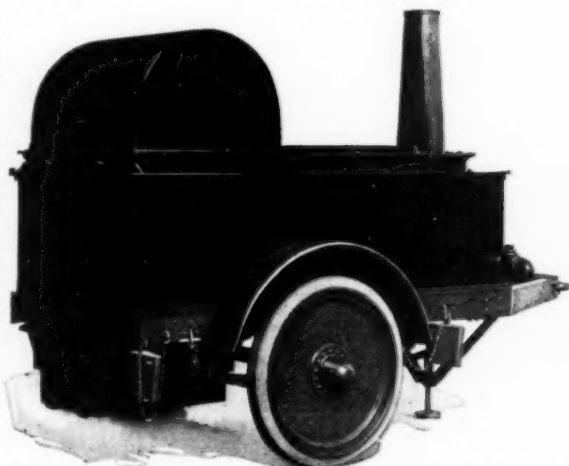
successfully accomplished, refusing to tackle the job. The one exception was Joe D. Karcher of Cadillac, who not only expressed his belief that it could be successfully carried out, but offered if necessary to back the venture with his last dollar. The project was started last fall and completed by the close of January, with the exception of a warehouse, some of the privately owned residences, and the church shown in the accompanying illustration. The work of moving the privately owned homes to this city is now going on.

## A Trailer Type Tar and Asphalt Heater

Increased Mobility of Heater Increases Its Range of Service

**C**ONTRACTORS will be interested in a new mounting of tar and asphalt heaters which has been developed by Littleford Brothers, 500 East Pearl Street, Cincinnati, Ohio. This new 500-gallon-capacity electrically-welded tar and asphalt kettle has been designed for mounting on army trailers, many of which can be picked up very cheaply throughout the country. The placing of a tar and asphalt heater on a spring-suspended chassis with rubber tires and roller-bearing wheels will solve the transportation problem, which in the past has limited the use of this kind of equipment. With this superior running gear, the tar and asphalt heater can be trailed behind rapidly moving vehicles in safety, enabling the contractor to use a single kettle on more jobs and thus reduce his capital investment.

The 300-gallon kettle is provided with a 2-inch draw-off valve on each side, and the cover is arranged with a warming hood, under which a barrel of tar or asphalt may be placed for draining. The furnace shelf which completely



THIS TAR AND ASPHALT HEATER MOUNTED ON A PNEUMATIC TRAILER SHOULD PROVE A HELP TO CONTRACTORS

surrounds the kettle is supported on each side and bolted securely to the chassis frame. A large fire-box, an improved type fire-door and renewable grate bars are conveniently located at the rear.

## Creosoted Timber Bridges, Docks and Wharves Give Forty Years' Life

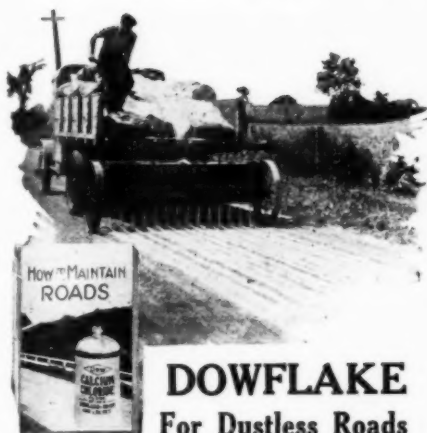
**T**HE use of treated timber for the construction of bridges, docks and wharves was the subject of a recent investigation by the Committee on Wood Preservation of the American Railway Engineering Association, through which they ascertained some very interesting facts on treated material.

A questionnaire was sent to a number of railroads, and the 33 replies received show that excellent results are being obtained from treated timber for heavy construction work. In open-deck bridges the creosoted timber had been in

use 15 to 24 years, and longer; in ballasted deck bridges, 15 to 30 years; and on docks and wharves, 15 to 40 years. In practically every case the structures are still in good condition, thus giving assurance of the realization of the popular opinion that treated timber in this kind of construction will give a life of 15 to 50 years, or more. That timber consumers appreciate the economy and desirability of using treated timber for construction purposes is indicated by greatly increased output.

—Wood Preserving News.





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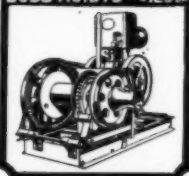
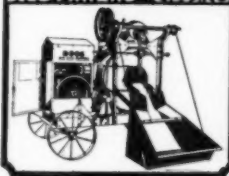
The American Cement Machine Co., Inc.

Keokuk, Iowa

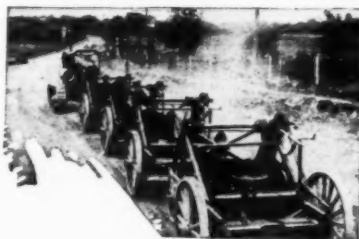
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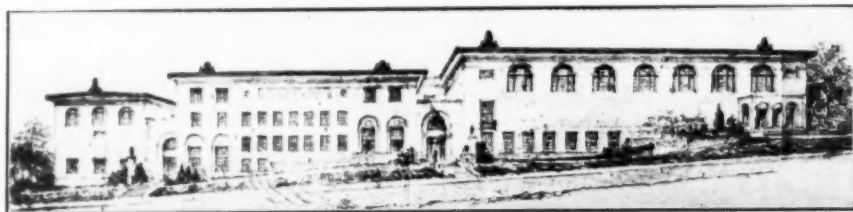
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PERSPECTIVE OF THE NEW GYMNASIUM FOR CARNEGIE INSTITUTE OF TECHNOLOGY, PITTSBURGH, PA.

## The New Carnegie Tech Gymnasium

**T**HE new \$400,000 gymnasium at Carnegie Institute of Technology, Pittsburgh, now under construction, will be ready for use by October of the present year. Concerted efforts to complete the building by that time are being made by the S. M. Siesel Company of Pittsburgh and Milwaukee, a contracting firm that is headed by S. M. Siesel.

The plans, which were made by Henry Hornbostel, architect, call for a building of four separate units: the women's gymnasium, the men's gymnasium, an administration building, and a swimming pool. Both gymnasiums and the swimming pool, it is said, will be the largest in Pittsburgh. Each gymnasium and the swimming pool will connect, by corridors, with the administration building, which will be located in the center of the group, and which will tower above its connecting units to the extent of one story.

In general design the new gymnasium is to follow the spirit of picturesque grouping of units to form, when finished, a large architectural composition. The material is to be light-colored brick similar to the other buildings, and the structure is placed on a piece of property 400 by 200 feet. Its plan is most unusual, for it has separated the different units, such as the gymnasium for men, the gymnasium for women, the administration division, and the swimming pool, giving each a separate building having windows on three or four sides, and all arranged in attractive grouping. This does away with the skylight, which has always been troublesome in buildings of this character.

The gymnasium for men is about 93 by 185 feet, spanned with three-point steel arches, with a wood block floor, and at one end a large stage has been constructed. The swimming pool, which is 75 by 35 feet, has ample space

on one side for bleachers, and directly on the side of the swimming pool building are the shower and toilet facilities for both men and women. The administration building is a three-story structure. It contains two trophy rooms, one for men and one for women, the medical offices for the two sexes, two corrective gymnasiums, and wrestling, fencing and boxing rooms. The women's gymnasium is a room 40 by 80 feet and is treated a little more elegantly, so that it may be used for entertainments.

The locker rooms are directly under the men's and women's gymnasium buildings respectively. There are two main entrances, one for men and one for women. The property, having considerable grade, allows these buildings to be grouped picturesquely one above the other, thus enhancing the interest of their silhouette. The roofs are all flat and built of 4 by 4 tongued and grooved mill flooring resting directly on the steel piers and girders and decorated with cast iron finials.

The arrangement of the plan has one thing of special interest, and that is stairs for men and for women. In each case there are two flights of stairs, one for direct communication between the gymnasium floor and locker and shower rooms, and one for communication between the gymnasium floors and administration quarters, thus separating the active from the visiting students. The gymnasium for men has a public entrance at one end so as to permit the visitors to enter to enjoy any athletic events without disturbing swimmers.

A pipe tunnel connects all the buildings and it in turn is connected with the main pipe tunnel of the group. This contains the steam main, electric wires and water-supply.

The building is extremely simple in its use of material.

## Miscellaneous Notes

### Changes in Cast Iron Pipe Organization

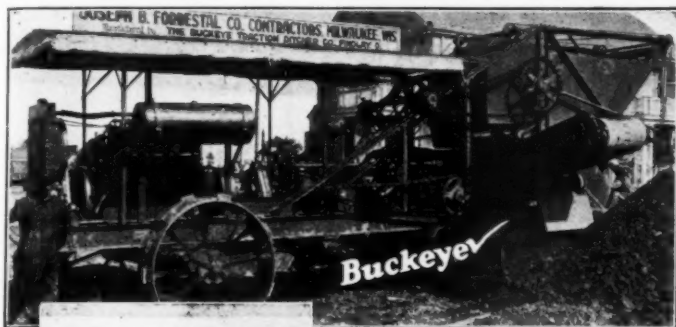
The United States Cast Iron Pipe & Foundry Company, Burlington, N. J., has announced that D. B. Stokes, formerly Western Sales Manager, is to be General Sales Manager, with offices in the Morris Building, Philadelphia, Pa.

W. G. Savage, is to be Western Sales Manager, in Chicago, Ill.

### Bond to Represent Smith Company

The T. L. Smith Company, Milwaukee, Wis., has announced the appointment of the Bond Company, 84 High Street, Boston, Mass., as its representative in the New England territory. The Bond Company will handle the sale of all Smith products, including concrete mixers, paving type mixers and excavators and loaders.





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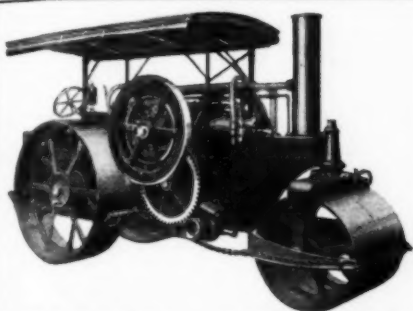
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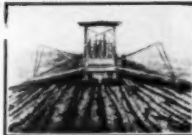
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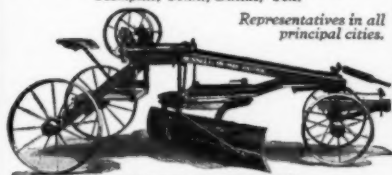
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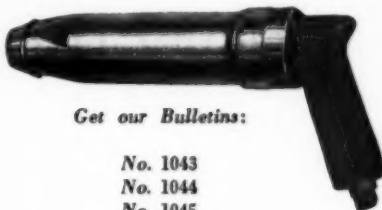
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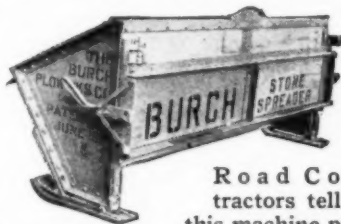
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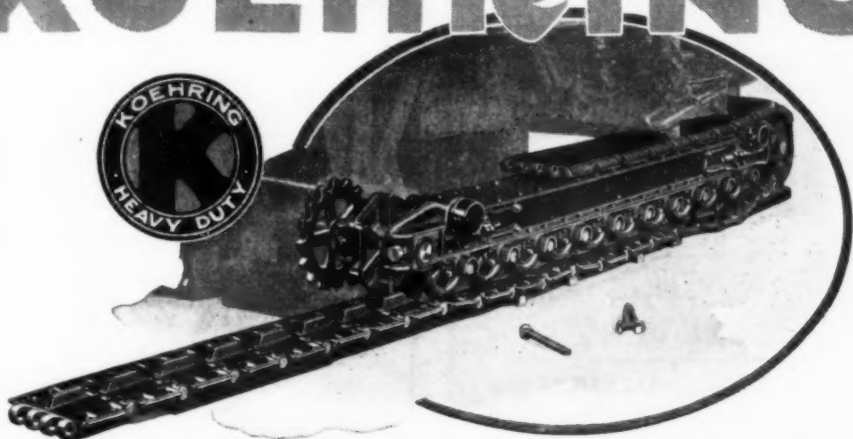
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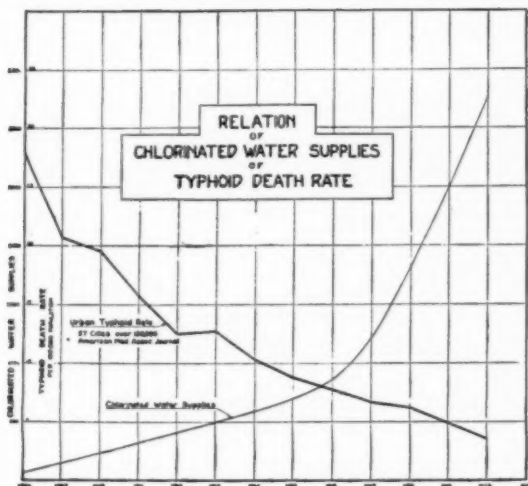
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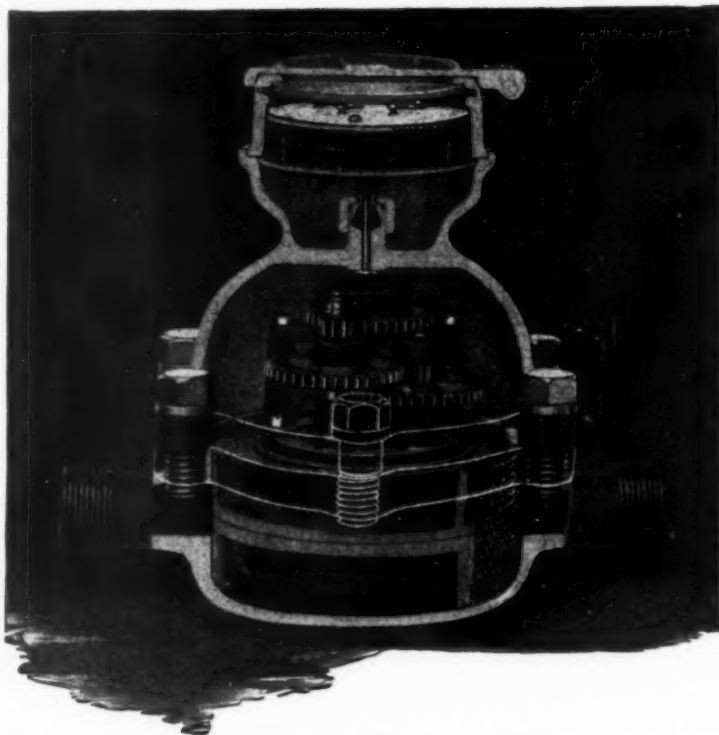
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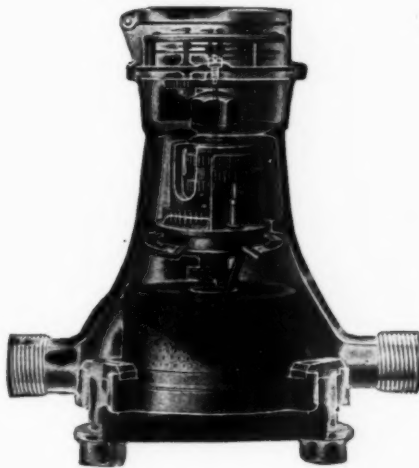
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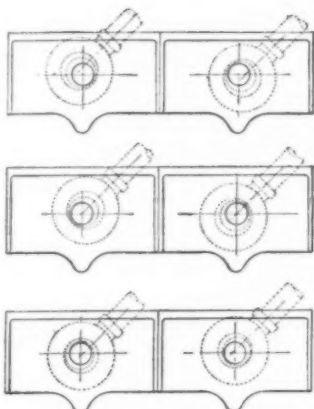
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# INDEX TO ADVERTISERS IN THIS ISSUE

Abrams Cement Tool Co.....	87	Garford Motor Truck Co.....	6	Pattison Supply Co., W. M.....	111
Adams Co., J. D.....	87	Gaston & Co.....	109	Pawling & Harnischfeger Co.....	14
Alexander, Edgar.....	103	General Machinery Co.....	116	Pease Laboratories, Inc.....	128
American Cement Machine Co.....	89	General Motors Truck Co.....	131	Pennsylvania Cement Co.....	92
American Park Builders.....	126	George & Co., Inc., E.....	110	Pioneer Asphalt Co.....	96
Anderson Bros. Mfg. Co.....	96	Gierke-Robinson Co.....	105	Pittometer Co.....	129
Anderson Tool & Sup. Co., W. H.....	106	Giles & Ransome.....	113	Pittsburgh Meter Co.....	118
Archer & Co., E. T.....	126	Godwin Co., W. S.....	99	Pollock, C. D.....	128
Ashmead, Henry C.....	101	Goodrich Rubber Co., B. F.....	8	Pope Equipment Co.....	112
Ashworth, F. K.....	126	Good Roads Machinery Co.....	30	Potter, Alexander.....	128
Atlas Engineering Co.....	45	Good Roads Supply Co.....	106	Potts, Clyde.....	128
Austin-Western Road Mach'y Co.....	94	Gross Hardware & Supply Co., P.....	116	Puffer-Hubbard Mfg. Co.....	43
Bacon Co., E. R.....	102	Haetten & Co., J. E.....	100	Queen City Supply Co.....	111
Bacon Engineering Co.....	111	Hais Mfg. Co., Geo.....	34	Rabbeitt, C. F.....	108
Badger Meter Mfg. Co.....	120	Hale & Co., Wm. H.....	107	Ransome Concrete Mach'y Co.....	46
Baker Mfg. Co.....	89	Halloran-McLean Tractor Co.....	115	Raymer Equipment Co.....	108
Banks & Craig.....	126	Hansen, A. E.....	127	Reading Engineering Co., Inc.....	110
Barber Asphalt Co.....	132	Harron, Rickard & McCone.....	102	Rensselaer Valve Co.....	129
Barrett, Thos. L.....	105	Harris, R. L.....	115	Rix Compressed Air & Drill Co.....	102
Bennett, Howard D.....	126	Harrison, Mertz & Emien.....	127	Robins Conveying Belt Co.....	92
Berkeley, W. N.....	126	Hazen & Whipple.....	127	Rochester Can Co.....	128
Best Tractor Co., C. L.....	32	Hell Co., Th.....	96	Roshalt Co., T. W.....	107
Boeck-Lowe Mach'y Co.....	116	Hercules Corporation.....	42	Rossiter Co., Edgar A.....	129
Bond Co., The.....	106	Higgins, J. Wallace.....	127	Ruane, T. F.....	114
Borchert-Ingersoll Co.....	107	Hill, Nicholas S.....	128	Russell Grader Mfg. Co.....	93
Bowe, Thos. F.....	126	Hillsman Co., G. E.....	104	Sauerman Bros.....	118
Brandeis Mach'y & Supply Co.....	105	Hofins-Ferris Equipment Co.....	116	Schmidt, Jr., C. G. A.....	113
Brewster & Williams, Inc.....	110	Hollander Equipment Co.....	100	Seibert Millburn Co.....	112
Brooks Co., R. E.....	109	Holt Manufacturing Co.....	83	Serviced Products Co.....	92
Brown, Fraser & Co.....	102	Holway Engineering Co.....	127	Shannon & Co., Jacob J.....	114
Brown, Thos. M.....	106	Hopkins & Field.....	127	Sheridan Plaza Hotel.....	118
Brown & Sites Co.....	109	Houston, J. C.....	110	Simms Co., T. B.....	103
Buckeye Traction Ditcher Co.....	91	Hubbard-Floyd Co., Inc.....	100-110	Smith, Booth-Usher Co.....	101
Buffalo-Springfield Roller Co.....	34	Hunter Mach'y Co.....	116	Smith-Courtenay Co.....	115
Buhl Machine Co.....	104	Hyland Co., R. H.....	104	Smith & Co., C. E.....	128
Burch Plow Works.....	99	International Motor Co.....	99	Smith & Co., Geo. F.....	108
Burnap, George.....	126	Jacoby Engineering Co., C. E.....	127	Smith & Co., Stuart S.....	102
Burnite Mach'y Co.....	103	Jaeger Machine Co.....	20	Saare Corporation, Frederick.....	126
Cameron & Barkley Co., Inc.....	103	Johnson Co., Inc., Geo. A.....	128	Solvay Process Co.....	12
Carey Co., Philip.....	95	Josam Mfg. Co.....	125	Standard Mach'y & Supply Co.....	114
Carlin Mach'y Co., J. H.....	114	Keiser-Geisner Engr. Co.....	101	Standard Oil Co. of Indiana.....	28
Central Equipment Co.....	108	Keystone Driller Co.....	101	Standard Supply and Equip. Co.....	114
Central Foundry Co.....	123	King, Philip T.....	110	Standard Testing Laboratories, Inc.....	128
Chadwick Bros. Co.....	116	Kinney Mfg. Co.....	16	Steinman, Dr. D. H.....	128
Chester Engineers, J. N.....	127	Kirchoffer, Wm. Gray.....	127	Sterling Wheelbarrow Co.....	44
Clark, Watson G.....	127	Kleinhaus & Co., H.....	100	Superior Supply Co.....	104
Clark Co., H. W.....	122	Koehring Co.....	36-117	Sweeney & Co., F. R.....	128
Climax Engineering Co.....	42	Koppel Ind. Car & Equip. Co.....	93	Sykes Company.....	112
Commercial & Ind Engr. Co.....	127	Kuhlman & Co., W. A.....	112	Terry & Tench Co., The.....	126
Conard & Buzby.....	128	Kuhn, Frank G.....	107	Texas Co., The.....	97
Conboy Co., John A.....	113	Landreth, O. H.....	127	Thomas, O. P.....	128
Concrete Mach'y & Supply Co.....	101	Lane Co., T. J.....	112	Tractor & Machinery Sales Co.....	111-116
Connelly Machinery Co.....	108	Layman, E. F.....	127	Tripp, B. Ashburnton.....	128
Connelly & Co.....	92	Light Railway Equip't. Co.....	113	Trucon Steel Co.....	2
Contractors Supply & Equip. Co.....	108	Littford Bros.....	24	Turner Co., C.....	115
Contractors Trading Co.....	109	London Concrete Mach'y Co. Ltd.....	102	Union Water Meter Co.....	129
Cox, H. L.....	113	Loomis Machine Co.....	42	Universal Road Mach'y Co.....	93
Crapster Co., Herbert.....	109	Louer Co., W. B.....	104	Urdis Co., G.....	128
Curd Equipment Co., Geo. B.....	111	Ludlow Valve Mfg. Co.....	129	U. S. Cast Iron Pipe & Fdy. Co.....	124
Dallett Co., Thos. H.....	94	Mandell, T. H.....	127	Vermeule, Cornelius C.....	128
Davis Engineering Co., C. B.....	101	McGraw, Inc., James.....	116	Wallace Equipment Co.....	107
Denver Rock Drill Mfg. Co.....	99	Mackintosh Engineering Co.....	111	Wallace & Tiernan Co., Inc.....	119
Dewey Supply Co.....	109	Martin Machinery Co., E. A.....	108	Ward Co., Lee T.....	114
Dixon Crucible Co., J.....	122	Mayne Engineering Co.....	127	Waring-Underwood Co.....	40
Dixie Machinery Co.....	105	McClure Green Engr. Co.....	127	Warren Bros.....	10
Dodge, C. R.....	106	McGraw-Hill Co.....	2	Western Contractors Supply Co.....	109
Dollin-Tucker-Smith Equip't. & Supply Co.....	104	McDonald & Burgmen.....	103	Western Supply Co.....	109
Dopp & Co., J. W.....	106	McKiernan-Terry Drill Co.....	26	Wetlaufer Bros.....	107
Doullat & Williams Co., Inc.....	127	Menge Pump & Mach'y Co.....	105	Whayne Supply Co., R. C.....	105
Dow Chemical Co.....	89	Meyer Co., Henry H.....	106	Wheeler-Murray Co.....	111
Draper, E. S.....	127	Michigan Equipment Co.....	107	Whinery, S. B.....	110
Dunn Road Mach'y Co.....	22	Midwest Laboratories.....	127	White Engineering Corp., J. G.....	126
Earnest Bros.....	111-115	Miller Equipment Co.....	110	White, Gilbert C.....	128
Edelen & Boyer Co.....	113	Mills Contractors Equip. Co.....	114	Williams Co., W. W.....	112
Engineering News-Record.....	4	Monroe & Sons, N. S.....	93	Wilson Machinery Co., J. Walker.....	112
Engineering Products Co.....	102	Moore, A. B.....	104	Wilson-Wesner Co.....	115
Equitable Asphalt Maint. Co.....	40	Mullergren, Arthur L.....	128	Wilson, W. R.....	110
Erie Machine Shops.....	34	Municipal Supply Co.....	34	Wood Hydraulic Hoist & Body Co.....	10
Federal Motor Truck Co.....	85	National Supply Co.....	112	Yancey Bros.....	103
File Equipment Co., Geo. W.....	105	Natl Water Main Cleaning Co.....	98	Young & Vann Supply Co.....	101
Forschner, Alfred J.....	113	Nelson, W. A.....	114	Ziegler & Co., Inc., Wm. H.....	107
Ford Motor Box Co.....	122	Neptune Meter Co.....	121	Ziegler Mach'y Co., Geo. W.....	114
Forsythe Bros.....	109	Newport Culvert Co.....	18		
Fowler, Chas. F.....	127	N. Y. Testing Laboratories.....	127		
Fraley, Lawrence V.....	108	Nixon-Hasselle Co.....	114		
Fuller & McClintock.....	127	Noble Co., K. B.....	103		
		Novo-Engine Co.....	38		
		Olmstead-Kent & Co.....	103		
		Olmsted & Co., H. G.....	128		
		Olsen, Olek.....	105		
		Olson, O.....	127		





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# INDEX TO ADVERTISERS IN THIS ISSUE

Abrams Cement Tool Co.	87	Garford Motor Truck Co.	6	Pattison Supply Co., W. M.	111
Adams Co., J. D.	87	Gaston & Co.	109	Pawling & Harnischfeger Co.	14
Alexander, Edgar	103	General Machinery Co.	116	Pease Laboratories, Inc.	128
American Cement Machine Co.	89	General Motors Truck Co.	131	Pennsylvania Cement Co.	92
American Park Builders	126	George & Co., Inc., E.	110	Pioneer Asphalt Co.	96
Anderson Bros. Mfg. Co.	96	Gierke-Robinson Co.	105	Pitometer Co.	129
Anderson Tool & Sup. Co., W. H.	106	Giles & Ransome	113	Pittsburgh Meter Co.	118
Archer & Co., E. T.	126	Godwin Co., W. S.	99	Pollock, C. D.	128
Ashmead, Henry C.	101	Goodrich Rubber Co., B. F.	8	Pope Equipment Co.	112
Ashworth, F. K.	126	Good Roads Machinery Co.	106	Potter, Alexander	128
Atlas Engineering Co.	45	Good Roads Supply Co.	106	Potts, Clyde	128
Austin-Western Road Mach'y Co.	94	Gross Hardware & Supply Co., P.	116	Puffer-Hubbard Mfg. Co.	45
Bacon Co., E. R.	102	Haetten & Co., J. E.	100	Queen City Supply Co.	111
Bacon Engineering Co.	111	Haisa Mfg. Co., Geo.	34	Rabbett, C. F.	108
Badger Meter Mfg. Co.	120	Hale & Co., Wm. H.	107	Ransome Concrete Machy. Co.	46
Baker Mfg. Co.	89	Halloran-McLean Tractor Co.	115	Raymer Equipment Co.	108
Banks & Craig	126	Hansen, A. E.	102	Reading Engineering Co., Inc.	129
Barber Asphalt Co.	132	Harron, Richard & McCone	115	Rensselaer Valve Co.	102
Barnett, Thos. L.	126	Harris, R. L.	127	Rix Compressed Air & Drill Co.	92
Bennett, Howard D.	126	Harrison, Merz & Emlen	127	Robins Conveying Belt Co.	87
Berkeley, W. N.	126	Hazen & Whipple	96	Rochester Can Co.	107
Best Tractor Co., C. L.	32	Heil Co., The	42	Rossiter Co., Edgar A.	129
Boehck-Lowe Machy. Co.	116	Hercules Corporation	127	Ruane, T. F.	114
Bond Co., The	106	Higgins, J. Wallace	128	Russell Grader Mfg. Co.	93
Borchert-Ingersoll Co.	107	Hill, Nicholas S.	104	Sauerman Bros.	118
Bow, Thos. F.	105	Hillsman Co., G. E.	116	Schmidt, Jr., C. G. A.	112
Brandeis Machy. & Supply Co.	110	Hofins-Ferris Equipment Co.	100	Seibert Millburn Co.	92
Brewster & Williams, Inc.	109	Hollander Equipment Co.	127	Servicised Products Co.	114
Brooks Co., R. E.	102	Holt Manufacturing Co.	127	Shannon & Co., Jacob J.	118
Brown, Fraser & Co.	106	Holway Engineering Co.	110	Sheridan Plaza Hotel	103
Brown, Thos. M.	91	Hopkins & Field	106-110	Simms Co., T. B.	115
Brown & Sites Co.	34	Houston, J. C.	111	Smith, Booth-Usher Co.	115
Buckeye Traction Ditcher Co.	99	Hubbard-Floyd Co., Inc.	104	Smith, Courtney	128
Buffalo-Springfield Roller Co.	104	Hyland Co., R. H.	104	Smith & Co., C. E.	108
Buhl Machine Co.	99	International Motor Co.	127	Smith & Co., Geo. F.	102
Burch Flow Works	126	Jacoby Engineering Co., C. E.	20	Smith & Co., Stuart S.	126
Burnap, George	103	Jaeger Machine Co.	128	Snare Corporation, Frederick	12
Burnite Machy. Co.	103	Johnson Co., Inc., Geo. A.	125	Solvey Process Co.	114
Cameron & Barkley Co., Inc.	103	Josam Mfg. Co.	101	Standard Machy. & Supply Co.	28
Carey Co., Philip	114	Keiser-Geisner Engr. Co.	94	Standard Oil Co. of Indiana	118
Carlin Machy. Co., J. H.	108	Keystone Driller Co.	16	Standard Supply and Equip. Co.	128
Central Equipment Co.	123	King, Philip T.	127	Standard Testing Laboratories, Inc.	128
Central Foundry Co.	116	Kinney Mfg. Co.	127	Steinman, Dr. D. B.	44
Chadwick Bros. Co.	127	Kirchoffer, Wm. Gray	100	Sterling Wheelbarrow Co.	104
Chester Engineers, J. N.	122	Kleinbans & Co., H.	36-117	Superior Supply Co.	128
Clark, Watson G.	42	Koehring Co.	112	Sweeney & Co., F. R.	112
Clark Co., H. W.	127	Koppel Ind. Car & Equip. Co.	107	Terry & Tench Co., The	97
Climax Engineering Co.	127	Kuhlman & Co., W. A.	127	Texas Co., The	128
Commercial & Ind. Engr. Co.	128	Kuhn, Frank G.	112	Thomas O. P.	128
Conard & Buzby	113	Landreth, O. H.	127	Tractor & Machinery Sales Co.	111-116
Concrete Machy. & Supply Co.	101	Lane Co., T. J.	127	Tripp, B. Ashburton	128
Connelly Machinery Co.	92	Layman, E. F.	127	Truscon Steel Co.	2
Conner & Co.	108	Light Railway Equipmt. Co.	24	Turner Co., C.	115
Contractors Supply & Equip. Co.	109	Littleford Bros.	102	Union Water Meter Co.	129
Contractors Trading Co.	113	London Concrete Mch. Co., Ltd.	42	Universal Road Machy. Co.	93
Cox, H. L.	109	Loomis Machine Co.	104	Urli Co., G.	128
Crapster Co., Herbert	109	Louder Co., W. B.	129	U. S. Cast Iron Pipe & Fdy. Co.	128
Curd Equipment Co., Geo. B.	111	Ludlow Valve Mfg. Co.	127	Vermeule, Cornelius C.	128
Dallett Co., Thos. H.	94	Mandell, T. H.	111	Wallace Equipment Co.	107
Davis Engineering Co., C. B.	101	McGraw, Inc., James	108	Wallace & Tiernan Co., Inc.	119
Denver Rock Drill Mfg. Co.	99	Mackintosh Engineering Co.	108	Ward Co., Lee T.	49
Dewey Supply Co.	122	Martin Machinery Co., E. A.	107	Waring-Underwood Co.	118
Dixon Crucible Co., J.	105	Mayne Engineering Co.	107	Warren Bros.	109
Dixie Machinery Co.	106	McClure Green Engr. Co.	2	Western Contractors Supply Co.	107
Dodge, C. R.	104	McGraw-Hill Co.	103	Western Supply Co.	107
Dollin-Tucker-Smith Equipmt. & Supply Co.	106	McDonald & Bugmen	105	Wetlaufer Bros.	105
Dopp & Co., J. W.	127	McKiernan-Terry Drill Co.	106	Wheeler-Murray Co.	110
Doullat & Williams Co., Inc.	89	Menge Pump & Machy. Co.	107	Whinery, S. B.	126
Dow Chemical Co.	127	Meyer Co., Henry H.	110	White Engineering Corp., J. G.	128
Draper, E. S.	22	Michigan Equipment Co.	114	White, Gilbert C.	128
Dunn Road Machy. Co.	111-115	Midwest Laboratories	93	Wiggins, Thos. H.	112
Earnest Bros.	4	Miller Equipment Co.	128	Williams Co., W. W.	112
Edelen & Boyer Co.	102	Mills Contractors Equip. Co.	110	Wilson Machinery Co., J. Walker	115
Engineering News-Record	40	Monroe & Sons, N. S.	34	Wilson-Wescor Co.	110
Engineering Products Co.	34	Moore, A. B.	112	Wilson, W. R.	10
Equitable Asphalt Maint. Co.	85	Mullergren, Arthur L.	98	Wood Hydraulic Hoist & Body Co.	10
Eric Machine Shops	105	Municipal Supply Co.	127	Yancey Bros.	103
Federal Motor Truck Co.	103	National Supply Co.	128	Young & Vann Supply Co.	101
Fife Equipment Co., Geo. W.	113	Nat'l Water Main Cleaning Co.	114	Ziegler & Co., Inc., Wm. H.	107
Forschner, Alfred J.	122	Nelson, W. A.	121	Ziegler Machy. Co., Geo. W.	114
Ford Motor Box Co.	109	Neptune Meter Co.	18		
Forsythe Bros.	127	Newport Culvert Co.	127		
Fowler, Chas. F.	103	N. Y. Testing Laboratories	114		
Fraley, Lawrence V.	103	Nixon-Hasselle Co.	103		
Fuller & McClintock	127	Noble Co., K. B.	38		
		Novo-Engine Co.	103		
		Olmstead-Kent & Co.	128		
		Olmsted & Co., H. G.	105		
		Olsen, Olek	127		
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